

STACKS - S.B.T.



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SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Corporate author: Inquiries should be addressed to the organization listed in the individual citation.

ABSTRACT CITATIONS

NHTSA accession number ----- HS-013 174

Title of document ----- **MAXIMUM BRAKE PEDAL FORCES PRODUCED BY MALE AND FEMALE DRIVERS**

Abstract ----- The object of this research was to obtain data concerning the maximum amount of brake pedal force that automobile drivers were able to sustain over a period of ten seconds. Subjects were told to apply the brakes in the test car as they would in a panic stop, and to exert as much force as possible on the pedal over the entire ten second test period. A total of 84 subjects were tested, including 42 males and 42 females. The results indicated that there is a wide distribution of values which characterizes the pedal force that the subjects were able to generate. Male subjects produced generally higher forces than did females. Over half the women tested were unable to exert more than 150 lbs. of force with either foot alone, but when both feet were applied to the pedal, force levels rose significantly.

Personal author(s) ----- by C. R. VonBrueck

Corporate author (or author's affiliation) ----- General Motors Corp.

Publication date; pagination ----- 1973? ; 18p

Supplementary note ----- Excerpts from Maximum Parking Brake Forces Applied by Male and Female Drivers (EM-23) BY R. L. Bierley, 1965, are included.

Availability ----- Availability: Corporate author

NHTSA accession number ----- HS-018 924

Title of document ----- **NATURAL FREQUENCIES OF THE BIAS TIRE**

Abstract ----- The lowest natural frequencies of a bias tire under inflation pressure are deduced by assuming the bias tire as a composite structure of a bias-laminated, toroidal membrane shell and rigorously taking three displacement components into consideration. The point collocation method is used to solve a derived system of differential equations with variable coefficients. It is found that the lowest natural frequencies calculated for two kinds of bias tire agree well with the corresponding experimental results in a wide range of inflation pressures. Results of the approximate analysis show that the influences of the in-plane inertia forces on natural frequency may be considered small, but the influences of in-plane displacements are large, particularly on the natural frequency of the tire under low inflation pressure.

Personal author(s) ----- by Masami Hirano; Takashi Akasaka

Journal citation ----- Publ: Tire Science and Technology v4 n2 p85-114 (May 1976)

Publication date ----- 1976; 6refs

Availability ----- Availability: See publication

RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT

A structurally realistic model of the human head-neck system, consisting of a water-filled endocranium skull and an artificial neck, was subjected to pendulum impact under nondestructive conditions. The neck consisted of a series of neoprene and aluminum rings fabricated so as to faithfully reproduce a living human's head motion in the sagittal plane. Both an aluminum spherical shell and a solid steel sphere were employed to produce contact durations of 1 msec to 6 msec and 0.2 msec to 1 msec, respectively, depending upon whether the impact occurred against the bare skull or against one of several scalp simulators used. Both frontal and occipital blows were produced on the system. A series of pressure transducers were suspended along the impact axis in order to measure the history of this parameter for the various conditions employed, and a crystal transducer arrangement ascertained the force input to the system. A displacement gauge was utilized to record the excursion of the head-neck junction. Significant differences in pressure response were noted between frontal and occipital blows without protective covers, most likely attributable to different vibrational patterns of the skull. On the other hand, the response of covered skulls was similar for frontal and rear blows. A substantial reduction in contact duration in the case of the bare and covered skulls was obtained upon employment of the solid sphere at similar striking velocities (relative to the aluminum shell), resulting in much larger coup pressures that decayed more rapidly. Much smoother and simpler pressure histories were obtained in the present tests than in corresponding tests using an acrylic shell for the head model, where pressures under similar impulse loading conditions were at least an order of magnitude larger; this difference is attributed to the layering effect of the real skull which was absent in the homogeneous shell previously used.

by W. Goldsmith; J. L. Sackman; G. Ouligian; M. Kabe
 Public Journal of Biomechanical Engineering v100 n1 p25-33
 (Feb 1978)
 1978; 26refs
 Availability: See publication

HS-023 824

EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976

The value of research methods in analyzing and evaluating emergency medical services systems is assessed, and the critical role of the system administrator as both a facilitator and user of evaluative research is emphasized. Thirteen papers are presented covering administrative functions, critical public service delivery (Kansas City, Mo.), decision making, methodology, experimental design and causal inference, social attitudes, research personnel, evaluation indicators, and appropriateness and feasibility of randomized field tests. Evaluation of emer-

gency medical services includes cost effectiveness and economic analysis.

by Leo Sechrest, ed.
 Jacksonville Experimental Health Delivery System, Inc., 1045
 Riverside Ave. (Suite 375), Jacksonville, Fla. 32204
 NCHSR-HS-81-10-72-314
 Rept. No. PB-279 696; NCHSR-78-46; DHEW-PHS-78-3195;
 1977; 133p refs
 National Center for Health Services Res., Res. Proceedings
 Series.
 Availability: NTIS

HS-023 825

THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN

A six-month Highway Safety Res. Inst. (HSRI) study is summarized which examined the dynamic stability of five types of tanker trucks commonly used to transport flammable fuels in Michigan (Michigan 11-axle double-tanker, Michigan double-tanker with pup removed or short Michigan-single, 5-axle single-tanker, conventional tractor with van-semitrailer, 11-axle single-tanker). The tasks of the study included a survey of bulk fuel-delivery operations in Michigan, mathematical analyses of the stability of tanker trucks, development of experimental modifications of the least stable truck (the double-tanker commonly called the "double-bottom tanker"), and full-scale testing of modified and unmodified double-tankers. Modifications recommended for the double-tanker consist of a redesigned hitch connecting the first and second trailers and a minor modification in trailer spring assemblies. These modifications, at an estimated cost of \$3,000 per vehicle, double the lateral stability of the second trailer during emergency lane changes. The major recommendation resulting from the study is that existing double-tankers be removed from the road until they can be equipped with modified hitch and trailer springs. This retrofitting makes the 11-axle double-tanker as stable as the 6-axle short Michigan single-tanker and almost as stable as the large 11-axle Michigan single-tanker. Further recommendations are to discourage, if not prevent, wide use of the short Michigan-single; to discourage partial loading of oil tankers, especially partial filling of individual compartments or loading of only reserve pup compartments; to conduct an in-service trial for all vehicle modifications before any mass introduction of retrofitted vehicles; to ensure that any policies which effect a change in the makeup of the tanker fleet transporting fuel in Michigan accounts for changes in the total exposure of the traffic system to fire hazard; and to conduct future research into optimum tanker design, the influence of road use laws on commercial vehicle design, and the dynamic properties of doubles used to transport various nonhazardous cargoes.

by Robert D. Ervin
 Pub: HSRI Research Review v8 n6 (May-Jun 1978)
 1978; 34p
 Sponsored by the State of Michigan Office of Hwy. Safety
 Planning
 Availability: See publication

HS-023 826

A DRIVING CYCLE FOR SYDNEY [DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA]

An investigation was undertaken to measure driving patterns in Sydney (New South Wales) to determine how representative is the U.S. Federal Driving Cycle currently being used for emission testing of motor vehicles in Australia, and to develop a driving cycle for Sydney. Morning traffic emissions are considered to constitute the most important precursors of smog formation because atmospheric temperature inversions which trap the emissions frequently occur during the morning in Sydney. Driving pattern measurements, using an instrumented vehicle, were therefore concentrated on morning peak traffic conditions. Speed histories were recorded and the data were analyzed to determine the statistics and the expected vehicle emissions for Sydney. A comparison with the U.S. Federal Driving Cycle (based on Los Angeles, Calif. driving patterns of 22 min 52 sec at 31.5 kph) revealed that root mean square acceleration for the Sydney traffic was higher by 28% and expected nitrogen oxides (NOx) emissions were higher by 18%. The joint speed-acceleration relative frequencies for the Sydney data were also found to be markedly different from the U.S. cycle. Sydney cruise speeds are centered around 48-56 kph, with an even distribution of acceleration and deceleration at low speeds. The U.S. cycle spends significant time at higher speeds and has two dominant acceleration peaks at low speeds. A short driving cycle (10 min 37 sec), designed to yield the same statistics and emissions as the overall survey data, was synthesized. The cycle may be used to measure emissions from Australian vehicles under conditions similar to Sydney peak morning traffic. The results should assist in estimating overall automobile emissions in Sydney and in determining emission control legislation.

by J. H. Kent; G. H. Allen; G. Rele
Publ: Transportation Research v12 n3 p147-52 (Jun 1978)
1978; 11 refs

Sponsored by the State Pollution Control Commission of New South Wales.
Availability: See publication

HS-023 827

SIMULATIONS OF TRAFFIC CONGESTION IN TORONTO

A traffic flow simulation program, TRANSYT, is used to estimate the external time costs that an additional vehicle using a congested city street imposes on other motorists on that street. The traffic flow on two-street networks in Toronto (Ontario) is simulated for the morning rush hour and a mid-day period. After simulating the actual traffic load in these two periods, traffic volumes on individual streets were varied one at a time by 100 vehicles per hour. The incremental delay to other vehicles from the addition of these vehicles is calculated by the program, and the number of vehicle hours of delay per additional vehicle mile traveled is determined. Assuming a value of time for all motorists, the incremental external time cost attributed to the added traffic on each street in each direction during each of the two periods can be determined. The simulated traffic variations show that the marginal external social cost of an added vehicle mile considering time costs alone ranges from zero on some roads to over one dollar per vehicle mile in the heavy direction in the morning rush hour. The average of this external congestion cost in the suburban area

for inbound motorists in the morning period, weighed by the volume of traffic, was 38 cents per vehicle mile. This study demonstrates the usefulness of a traffic simulation program for estimating congestion costs, and identifies some problems inherent in previous empirical approaches, such as variations up to 100 to 1 in congestion costs from one road to another and different congestion costs for a given road in peak and off-peak periods. The correlation between the estimated congestion costs from this simulation model and methods using volume-capacity ratios or average speed is poor. It is suggested that an accurate analysis of urban street congestion costs must in some way deal with behavior at, and interactions between, individual intersections. Traffic simulation models such as TRANSYT seem to be an ideal tool for this analysis.

by Donald N. Dewees
Publ: Transportation Research v12 n3 p153-61 (Jun 1978)
1978; 16 refs

Sponsored by the Connaught Fund of the University of Toronto.
Availability: See publication

HS-023 828

URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

An alternate interpretation is presented of a recent computer simulation study (1976) by the Honeywell Traffic Management Center which was prepared for the Federal Hwy. Administration and which addressed the effect of a variety of different traffic control scenarios on vehicular fuel consumption in an urban network. The results of the Honeywell study are shown to be consistent with a previously developed model of fuel consumption in urban traffic systems derived by conducting experiments in steel traffic (Evans and Herman, 1976). The Honeywell study proposed a linear relation between fuel economy and average trip speed. It is shown that their data fit better a linear relation between fuel consumed per unit distance and average trip time per unit distance. It is concluded that this formula is the most effective way to quantify the influence of average speed on fuel consumption.

by Leonard Evans; Robert Herman
Publ: Transportation Research v12 n3 p163-5 (Jun 1978)
1978; 7 refs

Availability: See publication

HS-023 829

MODELLING AN OVERSATURATED INTERSECTION

The traffic intersection with deterministic arrivals over a planning period is modeled by analogy with a reservoir. Under fixed cycle lengths, light settings are determined which minimize average line lengths of waiting vehicles. Under certain conditions, the fixed-cycle length requirement may be relaxed, resulting in approximately optimal cycle lengths. Constraints on maximum waiting time, maximum queue length, and minimum clearance during a cycle are appended to the fundamental model and trade-off analyses are suggested. Maximum line length may, in addition, be explicitly minimized. The single intersection is investigated for the case of two one-way intersecting streets. The case of two two-way intersecting streets is obvious and an easy extension of the two one-way

intersecting streets model. Extensions to serial intersections with limited waiting room are suggested. All problems are neatly cast as linear programs and hence are readily optimizable.

by Richard Church; Charles ReVelle
 Publ: Transportation Research v12 n3 p185-9 (Jun 1978)
 1978; 6refs
 Availability: See publication

HS-023 830

PERFORMANCE OF HIGHWAY SAFETY DEVICES. FINAL REPORT

New York highway accident records were compiled over a five-year period (1971-1975) in order to assess performance of lightweight-post guidrails and median barriers, slip-base sign posts, frangible-base luminaire supports, and impact attenuation devices. In 1969, rail mounting heights on New York's barriers were increased to 27 in. to the center of the rail element, in an effort to reduce barrier penetration. While this height was not uniformly achieved on the barriers monitored, the results of 392 accidents indicate good performance. Injury rates were very low, with only eight serious injuries and no fatalities recorded. Penetration occurred in only 4% of midsection accidents, a significant reduction over the rate recorded in an earlier study of light-post barriers. Barrier-length damaged was found to be inversely related to stiffness, as expected, but barrier types differed little in accident repair costs. Based on only ten accidents, slip-base sign supports appeared to be performing satisfactorily. Performance of aluminum frangible-base luminaire supports was also excellent, based on 78 accidents. A total of 393 impacts recorded on four types of attenuators, (sand-filled plastic barrels, water-filled cell-sandwich units, water-filled clusters, empty steel drums) resulted in only six severe injuries and one fatality. Most of these serious accidents were related to specific problems with individual attenuators or with secondary collisions. Repair costs were much higher for sand-barrel attenuators than for the two types of water-filled cells, but initial installation costs were much lower. Water-filled cell units may require major repairs or replacements after only a few impacts. From the number and types of accidents recorded, it is apparent that attenuators have been very successful in reducing the potential for serious injuries and fatalities when vehicles collide with fixed objects.

by Robert D. Carlson; Joseph R. Allison; James B. Brydon
 New York State Dept. of Transportation, Engineering Res. and Devel. Bureau, State Campus, Albany, N.Y. 12232
 HPR-RCP-41K1-095
 Rept. No. FHWA-NY-77-57; RR-57; PB-279 505; 1977; 54p
 10refs

Prepared in cooperation with Federal Hwy. Administration.
 Availability: NTIS

HS-023 831

ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING

The methodology of roadway reflectance measurement employing a target substitution technique is presented in an effort to determine the influence of atmospheric extinction during automobile headlight experiments, an influence that can be important before it becomes visually apparent. Additionally,

some theoretical considerations are presented in conjunction with the target substitution method when direct measurement of the extinction coefficient is not possible. This study shows that more attention must be directed to the problem of atmospheric luminance in conjunction with automobile headlight research. The evaluation of factors governing vision during night driving requires an accurate assessment of the prevailing luminance levels. It has been shown that light scattering in the atmosphere can bias the measurement of the retroreflectance of dark road surfaces to a significant degree. It does not appear possible to formulate predictive detection models that require luminance and luminance difference computations unless atmospheric scattering is included. There is need for independent measurement of the extinction coefficient in conjunction with a study of this nature; unfortunately, this was not possible. The indirect method presented in this study, however, does give an estimate of the atmospheric influences existing during an experimental session.

by Peter Huculak
 National Res. Council Canada, National Aeronautical Establishment, Ottawa, Ont. K1A 0S2, Canada
 Rept. No. LTR-ST-987; 1978; 18p 5refs
 Availability: Corporate author

HS-023 832

AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER

Illustrations are provided of the Fiat Research Center's wind tunnels, one aerodynamic and two climatic, for true-scale vehicle testing, and a detailed description of the tunnels' relevant performance and fluid-dynamic characteristics is presented. All three tunnels are of a closed-circuit, semi-open test section design, have the same wind circuit duct configuration, and are built of reinforced concrete (aerodynamic) and of sheet steel (climatic). Also described is fluid-dynamic investigation work on a scaled-down wind tunnel pilot model which was conducted as an aid in optimizing air-duct configuration and design.

by G. Antonucci; G. Ceronetti; A. Covelli
 Fiat Res. Center, Italy
 Rept. No. SAE-770392; 1977; 15p
 Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
 Availability: SAE

HS-023 833

LESSONS FROM THE FIRESTONE FRACAS (FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS)

Defending itself from charges of making defective Firestone 500 radial tires, it is felt that the Firestone Tire and Rubber Co. has used tactics that have worsened its own ordeal, almost inviting suspicion and doubt. Firestone has repeatedly tried to thwart investigations by the National Hwy. Traffic Safety Administration (NHTSA) of the 500 radial, and has publicly impugned the motives of the investigators as well, thus prolonging and intensifying its ordeal. Firestone, in early spring of 1977, when the investigation had not yet become common knowledge, held a major clearance sale of 500's in the Southeast. Firestone explained that it was phasing the tire out,

but the company should have anticipated that in the light of publicity accompanying the government's investigation, the sale would then appear, whether justly or not, as a desperate effort to unload damaged goods. The Firestone 500 radial began attracting helpful attention from consumer advocates in 1976, when the Center for Auto Safety received a large number of complaints, mainly about tread separations and blowouts. These data were turned over to NHTSA, which began its own investigation. Firestone contends that NHTSA bears a grudge against the company and suggests that it is part of a Naderite conspiracy. Firestone, in an attempt to suppress the results of a survey of tire owners conducted by NHTSA, obtained a restraining order which was issued in Mar 1977, preventing NHTSA from making the results public. Firestone's effort at censorship backfired, however. People who had been unaware of the radial-tire crisis read about the court's action and began asking what the company had to hide. In particular, the episode aroused the suspicions of Congressman Moss, an ardent consumerist and chairman of the House Com. on Interstate and Foreign Commerce's subcommittee on oversight and investigations. Four days of hearings resulted, with the Firestone company receiving still more bad publicity. Ironically, the results of the NHTSA survey reached the public anyhow. Firestone has also tried to thwart NHTSA's investigation by not responding to several requests for certain information concerning the company's steel-belted radial tires. Eventually NHTSA took Firestone to court in an effort to force compliance with its "special order"; the case is presently before a U.S. District Judge in Washington, D.C. NHTSA has also made an "initial determination", after hundreds of accidents and at least 34 deaths, that the 500 radial had a safety-related defect, and recommended immediate recall.

by Arthur M. Lewis
Publ: Fortune v98 n4 p44-8 (28 Aug 1978)
1978
Availability: See publication

HS-023 834

AN ON-BOARD SENSOR FOR PERCENT ALCOHOL [IN-TANK ETHANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL]

A sensor system is described which electrically measures the in-tank ethanol concentration of automotive fuels in order to supply a correction signal to the ignition spark advance electronics and/or the fuel metering system for A/F (air-fuel ratio) adjustment. This measuring device was developed because ethanol additions to the Brazilian fuel supply are seasonal and regionally variable, and therefore cars in Brazil must now function with gasoline/alcohol mixtures ranging in alcohol content from 0% to 30%. These variations are presently accommodated by tuning the engine for 30% alcohol. Thus, when operating without alcohol, the engine runs excessively rich with the spark advanced too far, unless a correction signal is provided. In this sensor system, a circuit was developed to convert alcohol concentration (derived from mixture capacitance) into a voltage which was corrected for ambient temperature. The sensor with compensation for temperature works quite well over a temperature range of -15 degrees C. to plus 50 degrees C.

by John W. Hill; Paul R. Rabe
Publ: IEEE Transactions on Vehicular Technology vVT-27 n3 p142-4 (Aug 1978)
1978; 4refs
Availability: See publication

HS-023 835

TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM

A technique is described for obtaining synchronization signals from an engine's ignition system without significantly perturbing the radiated electromagnetic fields in the 20 MHz to 1,000 MHz range. The synchronization allows the radiated RF (radio frequency) to be correlated to individual ignition events by observing the video output of a spectrum analyzer or RFI (radio frequency interference) receiver as a function of time. This technique may be used by engineers working in this field as a diagnostic aid in identifying problem areas in particular vehicles or types of vehicles. It allows a high degree of discrimination against RF radiation that is not synchronized to the ignition system, whether it be from the vehicle itself or from some background source. This time correlation with particular events is variable when assessing the effect of component modification on the RF radiation which might normally be obscured by a stronger source unaffected by the modification. Examples of the types of data that can be obtained by using the technique are described. Information is given concerning the cylinder-to-cylinder variations and the statistical nature of the radiation due to distributor arcing and spark plug arcing. Greater diagnostic potential of this technique could be realized by using a local-field probe rather than a far-field antenna. This would allow a spatial resolution, as well as time resolution, which could lead to identification of secondary radiating noise sources.

by Wayne J. Johnson
Publ: IEEE Transactions on Vehicular Technology vVT-27 n3 p138-42 (Aug 1978)
1978; 10refs
Presented at 37th Annual IEEE Vehicular Technology Conference, Orlando, Fla., 16-18 Mar 1977.
Availability: See publication

HS-023 836

TIRE VIBRATIONS

Natural frequencies and vibrating motions are determined in terms of the material and geometric properties of a radial tire modeled as a thin ring on an elastic foundation. Experimental checks of resonant frequencies show good agreement. Forced vibration solutions obtained are shown to consist of a superposition of resonant vibrations, each rotating around the tire at a rate depending on the mode number and the tire rotational speed. Theoretical rolling speeds that are upper bounds at which standing waves occur are determined and checked experimentally. Digital Fourier transforms, transfer function, and modal analysis techniques used to determine the resonant mode shapes of a radial tire reveal that anti-resonances are the primary transmitters of vibration to the tire axle. The value of such a crude tire model is in isolating and determining the trend of the important engineering variables in altering the vibration performance in tires, before new designs are contemplated. The importance of identifying a tire's resonant structure lies in knowing the anti-resonances for vibration transmission as well as the higher mode resonances in predicting upper bound standing wave speeds.

by G. R. Potts; C. A. Bell; L. T. Charek; T. K. Roy
NSF-GK-32627
Publ: Tire Science and Technology v5 n4 p202-25 (Nov 1977)

HS-023 837

DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD

The deformation properties and cord tension distribution of a bias tire are analyzed by assuming the tire carcass under inflation pressure to be a toroidal membrane shell of elliptical cross section having a hyperbolic-type of anisotropy, and the tire tread to be an elastic foundation. Displacement components of a carcass are approximated by an appropriate linear combination of finite terms and are determined by the principle of minimum potential energy. Numerical results for the deformation properties and the cord tension distribution agree well with corresponding experimental results. Future research is recommended on the numerical analysis of the deformation and the cord tension distribution of tires under various loadings when the cord is considered to be extensible.

by Takashi Akatsuka; Kazuyuki Kabe
Publ: Tire Science and Technology v5 no 4 p71-201 (Nov 1977)
1977; 40cfs
Availability: See publication

HS-023 838

GRADE EFFECTS ON TRAFFIC FLOW STABILITY AND CAPACITY

A research project was undertaken to provide and apply a methodology to determine the performance capabilities of vehicles on public highways, to determine equivalency factors for low-performance vehicles, and to determine the role that performance and size play in traffic instabilities, accidents, and loss of capacity. The acceleration and speed-maintenance capabilities of a wide range of vehicles were determined with performance tests and analyses of data in the literature. The vehicles included trucks and combinations, buses, campers, travel trailers, passenger cars of low performance and other atypical vehicles found on interstate and primary highway systems. A computer simulation was developed based on field measurements and data published in the literature. The simulation was applied to determine equivalencies and to explore the accident implications of the two-lane, two-way traffic situations. A major goal of this research was to provide guidance for the establishment of regulations covering the road transport of wider than normal loads by determining, through direct observations, the effects on safety and traffic flow of 12- and 14-ft-wide loads on highways in varying terrain. A summary of results of research from a more extensive FHWA (Federal Hwy. Administration) project is included in the appendices. From the data collection activities of the present study, the following conclusions are drawn: The acceleration capabilities of individual passenger vehicles and recreational vehicles are linear functions of speed and grade. The acceleration capabilities of individual passenger and recreational vehicles can be estimated from their brake horsepower, gross weight, gear ratios, projected frontal area, and the general characteristics of the body shape. Drivers of passenger and recreational vehicles restrict their demand for performance on long upgrades to about 7/10 of the maximum available horsepower. The physical data to estimate performance characteristics for the vehicle population are not available in a directly usable form. The acceleration capabilities of individual trucks are nonlinear functions of speed and grade. The acceleration capabilities of in-

trucks in the range of 100 to 200, with a very few as high as 300. On steep grades, these vehicles perform like trucks of the same ratio. On moderate grades (plus or minus 2%), the maximum speed of these combinations are 5 mph to 10 mph less than the maximum speeds of conventional trucks with equal weight/net horsepower ratios. The anomalously low capacities observed for two-lane, two-way highways are probably associated with driver response to high frequency encounter with oncoming vehicles. Finally, it is concluded that the simulation program developed for two-lane, two-way traffic can be used to determine traffic speeds and characteristics with a realistic account of vehicle characteristics and highway geometries. Recommendations are made for adapting the simulation program to varying circumstances.

by A. D. St. John; D. R. Kobett
Midwest Res. Inst., Kansas City, Mo.
Rept. No. NCHRP-185; 1978; 120p 60cfs
Availability: TRB \$6.40

HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

by S. Balli; R. Potts; J. A. Fee; J. L. Taylor; J. Glenness
Science Applications, Inc., 1200 Prospect St., La Jolla, Calif.
92038
DOT-PII-11-8567
Rept. No. FHWA-RD-78-50; 1978; 22p 90cfs
Rept. for Jan 1975-Mar 1978. For abstract, see HS-023 840 (Vol. 2); Vol. 3, Appendix A, is HS-023 904; Vol. 4, Appendix B, is HS-023 841; Vol. 5, Appendix C, is HS-023 842; Vol. 6, Appendices D and E, is HS-023 905.
Availability: NTIS

HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

The effect of various delineation treatments on accident rates was assessed by analyzing accident data from more than 500 roadway sites in 10 states for tangent, winding and isolated horizontal curve sections on two-lane rural highways. Cost-benefit and cost models for evaluating specific delineation treatments were developed and guidelines formulated by executing the cost-benefit models for selected delineation treatments. The study includes a discussion of the study design, site selection, data collection, and analysis, results of model development, and delineation guidelines. The study indicated that for tangent and winding sites, highways with centerlines have lower accident rates than those without delineation, that raised pavement marker (RPM) centerlines lower the accident rate further, and that highways with post delineators have lower accident rates than those without (in the presence or absence of edgelines). Accident statistics of sites with and without edgelines are inconclusive. Reductions in accident rates, where stronger delineation treatments are used, were

there is some indication that post delineators and centerlines have a beneficial effect. Delineation guidelines derived from the cost-benefit models produced by this study indicate that adding a painted centerline will be cost-justified over the entire range of costs, service lives and average annual daily traffic (AADT). Painted centerlines should be replaced by RPM centerlines for an expected service life of five years or over, and an AADT of over 3000 vehicles/day. Edgelines with service lives of five years will be justified for highways with an AADT of over 500 vehicles/day. Edgelines with two-year service lives are cost-justified if the installation costs are less than \$165/mi. Edgelines with a one-year service life are almost always justified if the AADT exceeds 1000 vehicles/day. Analyses for some subsets of roadways indicate that edgelines are detrimental to traffic safety at these sites. Post delineators are cost-justified at all AADT's above 1000 vehicles/day and for most AADT's of 500 vehicles/day.

by S. Ball; R. Potts; J. A. Fee; J. I. Taylor; J. Glennon
Science Applications, Inc., 1200 Prospect St., La Jolla, Calif.
92038
DOT-PH-11-8587
Rept. No. FHWA-RD-78-51; 1978; 131p 10refs
Rept. for Jan 1975-Mar 1978. Vol. 1, Executive Summary, is HS-023 839; Vol. 3, Appendix A, is HS-023 904; Vol. 4, Appendix B, is HS-023 841; Vol. 5, Appendix C, is HS-023 842; Vol. 6, Appendices D and E, is HS-023 905.
Availability: NTIS

HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

The development of the computerized site and accident data base is described in detail, including standardization of data from different formats, and coding on computer cards for creation of a permanent tape file. This process involved development of compatible data codes and resolution of coding discrepancies. The basic data tape was not suitable for direct use by statistical analysis programs, but required generation of intermediate programs and disk files. Criteria were established for selecting sites for the matching-control analysis and the before-after analysis. The latter, not being readily programmable, was used to generate a hand list of sites to be fed into the computer.

by S. Ball; R. Potts; J. A. Fee; J. I. Taylor; J. Glennon
Science Applications, Inc., 1200 Prospect St., La Jolla, Calif.
92038
DOT-PH-11-8587
Rept. No. FHWA-RD-78-51; 1978; 120p
Rept. for Jan 1975-Mar 1978. Vol. 1, Executive Summary is HS-023 839; Vol. 2, Final Report, is HS-023 840; Vol. 3, Appendix A, is HS-023 904; Vol. 5, Appendix C, is HS-023 842; Vol. 6, Appendices D and E, is HS-023 905.
Availability: NTIS

HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE

HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

Development of the statistical model is described in detail, including a cost-benefit model. The statistical analysis is broadly classified into theoretical modeling of accident rate distribution, descriptive statistics of site types, matching-control analysis of sites with unaltered delineation treatment, and before-after analysis of sites where delineation was upgraded. The matching-control analysis included selection and evaluation of alternative dependent variables.

by S. Ball; R. Potts; J. A. Fee; J. I. Taylor; J. Glennon
Science Applications, Inc., 1200 Prospect St., La Jolla, Calif.
92038
DOT-PH-11-8587
Rept. No. FHWA-RD-78-51; 1978; 250p
Rept. for Jan 1975-Mar 1978. Vol. 1, Executive Summary, is HS-023 839; Vol. 2, Final Report, is HS-023 840; Vol. 3, Appendix A, is HS-023 904; Vol. 4, Appendix B, is HS-023 841; Vol. 6, Appendices D and E, is HS-023 905.
Availability: NTIS

HS-023 843

USING WASTE HEAT BOOSTS DIESEL EFFICIENCY

A number of options currently exist for capturing and using a portion of the heat normally wasted in a heavy truck's exhaust. Truck engines currently reject up to 40% of total fuel energy in their exhaust. To utilize as much of this waste heat as possible, preheating, regeneration, turbocharging, turbocompounding, and Rankine engine compounding concepts have been simulated, and options compared for diesel, spark ignition, gas turbine, and Stirling engines. In Rankine engine compounding, the exhaust energy of the base engine is used as a heat source to vaporize a low-boiling liquid and to expand the vapor in an expander, with the power generated being transmitted back to the base engine. Of the Rankine cycle components, the expander is the most difficult to design for high efficiency, and the most important. Three types of expanders under development are the turbine, the reciprocating piston expander and the multi-vane rotary expander. The principal difficulties with the multi-vane type are internal leakage, friction, and selection of fluid. Rankine engine compounding offers three times more fuel economy improvement than turbocompounding at possibly three times the cost, but it seems the most promising choice with likely 10% to 15% gains for long-haul diesels. Development of the necessary hardware for applying the Rankine bottoming cycle is fairly far advanced.

Puhl; Automotive Engineering v86 n8 p84-94 (Aug 1978)
1978
Based on SAE-780686, "Waste Heat Recovery in Truck Engines," by C. J. Loring, G. P. Purohit, S. P. DeGree, and J. G. Pinegold; and SAE-780689 "A Multi-Vane Expander, by Adding Power, Can Improve the Fuel Economy of Long-Haul Diesel Trucks," by C. S. Robertson and S. E. Eckard, presented at West Coast Meeting, San Diego, 7-10 Aug 1978.
Availability: See publication

HS-023 844

THE TURBINE STROKE ENGINE: PROBLEMS AND PROMISES

An assessment of the variable stroke engine's (VSE) fuel economy potential vs. its conventional throttled equivalent was

combustion chamber studies conducted at three different strokes (51 mm, 76 mm, and 102 mm), while motoring power data of the Pouillet engine (a 5-cylinder VSE recently built and tested by Sandia Labs) were used as the basis for friction estimates. An "ideal" motoring power data set was generated from these data to project lowest probable friction for the VSE in estimating maximum fuel economy potential. To extend these calculations to a vehicle basis, fuel consumption and emissions were calculated for the case of a 3.16-L VSE installed in both 364 and 1,591 kg vehicles. A regression model of the VSE as coupled with models of the above vehicles and models of the hot-start EPA (Environmental Protection Agency) urban and highway driving schedules to permit estimation of 55/45 of consumption at differing emission levels. At the allowable CO (nitrogen oxides) level, VSE's show calculated gains in fuel economy of 2% to 20%, the difference being mainly due to variations in friction loss data.

Publ: Automotive Engineering v86 n8 p76-82 (Aug 1978)
1978: 2refs

Based on SAE-780700 "The Variable Stroke Engine-Problems and Promises," by Donald C. Siegel and Robert M. Siewert, presented at West Coast Meeting, 7-10 Aug 1978.
Availability: See publication

HS-023 845

STRATIFIED CHARGE MIXING STRATEGIES COMPARED

Characteristics of five types of stratified-charge combustion systems (Texaco Combustion Process (TCP), Mitsubishi Combustion Process (MCP), Ford Combustion Process (FCP), swirl stratified charge rotary combustion (SCRC), and swirl stratified charge (SSC)) were evaluated recently by the Southwest Res. Inst. This study of unthrottled, open-chamber, stratified-charge powerplants indicated that current stratified-charge engine designs may not fully realize their potential for chamber control of exhaust emissions (HC (hydrocarbon), CO (carbon monoxide), and NOx (nitrogen oxides)). The potential advantages of this type of engine include part load fuel economy due to overall lean mixtures and to reduction of idling losses, reduction in octane sensitivity, and smoother combustion and improved cold starting over the diesel engine. Engine weight, speed, and torque characteristics can be equivalent to the spark ignition engine, and it is thought that exhaust emissions will be lower. All stratified-charge engines tested, however, had HC emissions higher than conventional engines, and increased CO concentrations with increasing load except TCP-I. NOx emissions also increased until full load was approached. It was concluded that more detailed knowledge is needed concerning the various mixing processes and jet air environment, and diffusion, and mixing due to air-density gradients, and that innovative thinking is required for other critical areas (injection nozzle design, lean-mixture ignition, and control of cylinder air motion and turbulence).

Publ: Automotive Engineering v86 n8 p68-75 (Aug 1978)
1978

Based on SAE-780341 "Unthrottled Open-Chamber Stratified Charge Engines," by Charles D. Wood, presented at Annual Congress, Detroit, 27 Feb-3 Mar 1978.
Availability: See publication

FAST BURN NOX REDUCES NOX SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES]

Experimenters at Nissan Motor Co., Ltd. (Japan) have concluded that short combustion duration (fast burn) with heavy EGR (exhaust gas recirculation) not only improves engine stability and substantially reduces NOx (nitrogen oxides), but also provides improvement in fuel economy. A Datsun in-line, four-cylinder 1.8-L engine running on standard unleaded Silver-N gasoline was studied. A piezoelectric pressure transducer installed in the number-4 cylinder monitored combustion chamber pressures, while an IBM 370 computer carried out on-line data processing of the output signal. Both cycle-by-cycle and statistical calculations were performed. Indicated mean effective pressure (Pi) and cylinder heat release rate for each cycle were calculated, as were standard deviation and fluctuation rate of Pi for 400 consecutive cycles. Mass fraction of charge burned was also computed from the average pressure trace. Understanding of the correlation between Pi levels and flame propagation was a primary objective of the experiment. Four ion gaps were installed in the same number-4 cylinder to detect passage of the flame front, and ionization signals and cylinder pressure traces were compared with corresponding calculated Pi values. An engine sensibility meter was developed to provide more precise measurements and higher reproducibility than was available from human sensing. An excellent correlation was found between meter output and subjective studies. The meter consisted of a sensor detecting transverse engine displacement, a low pass filter, and a root mean square circuit. Most test data were acquired for two speed-torque sets, 1,400 rpm, 30 N.m, and 1,600 rpm, 50 N.m, representative of engine conditions under the Japanese 10-mode test cycle for cars of 1,250 kg I.W. (inertial weight) class. For each test condition, air-fuel ratio, EGR rate, and spark timing were varied. An inlet air conditioner was used to provide temperature and humidity controlled air. Exhaust gas was sampled at each exhaust port and the tailpipe to measure concentrations of the major component gases. CO2 (carbon dioxide) concentration in all four intake manifold branches was measured to calculate average and cylinder-by-cylinder EGR rates. Due to the small variations found, data obtained from the number-4 cylinder were considered representative.

Publ: Automotive Engineering v86 n8 p56-62 (Aug 1978)
1978

Based on SAE-780006 "The Fast Burn with Heavy EGR, New Approach for Low NOx and Improved Fuel Economy," by H. Kuroda, Y. Nakajima, K. Sugibara, Y. Takagi, and S. Murohara, presented at Annual Congress, Detroit, 27 Feb-3 Mar 1978.
Availability: See publication

HS-023 847

EEC-I plus 3-WAY/EEC-II (FORD'S ELECTRONIC ENGINE CONTROL.)

The hardware is described for Ford's EEC-I Electronic Engine Control which combines interactive adjustment of spark advance and EGR (exhaust gas recirculation) flow with carbureted, oxygen-sensed, three-way emissions control. The interactive spark/EGR portion evolved from EEC-I, introduced on the 1977 Lincoln Versailles; the three-way system from experience with California 2.3-L Pintos and Roberts. EEC-II is

have also been designed for maximum product coverage. With EEC-II, these sensors monitor crankshaft rotation, barometric and manifold absolute pressures, oxygen content in the exhaust stream, EGR valve position, coolant temperature, and throttle position. Signals are assimilated by the microprocessor which uses table look-up and interpolation to compute optimal settings of spark advance, EGR flow, and fuel-flow trim. Downstream emissions are controlled by a single converter operating in two distinct catalytic modes. A three-way bed lies immediately upstream of a conventional oxidizing unit. These are separated by a secondary air injection port feeding the latter. An oxygen sensor in the right-bank exhaust manifold gives input to an air-fuel ratio feedback control performed via fuel-flow trim in a modified variable-venturi carburetor. This system keeps the engine operating near enough to stoichiometric so that three-way conversion is effective. The dual-bed approach and engine EGR allow an acceptable NOx (nitrogen oxides) conversion rate somewhat below that required with other three-way converters.

Publ: Automotive Engineering v86 n8 p49-54 (Aug 1978)
1978

Based on information provided by Robert S. Elliott and Gary M. Marx, Ford Motor Co., as well as on SAE-780119 "A Practical Application of Microprocessors in the Automotive Environment," by G. Gilbrat, SAE-780203 "Ford Three-Way Catalyst and Feedback Fuel Control System," by Robert E. Seiler and Robert J. Clark; SAE-780211 "Temperature Sensors for Electronic Engine Control Systems," by James E. Acker; SAE-780213 "Application of a Crankshaft Position Sensor to Control Engine Timing," by J. C. Cook, 2nd; and SAE-780214 "The First Production Automotive Capacitive Pressure Sensor," by Gary M. Marx and Robert L. Bell.
Availability: See publication

HS-023 848

WILENCE THE 1981-84 FUEL ECONOMY STANDARDS?

Background and rationale used by the National Hwy. Traffic Safety Administration (NHTSA) in determining Average Fuel Economy Standards (AFES) for the period 1981-1984 are described. These AFES of 22, 24, 26, and 27 mpg, respectively, for each year of the period are based on extensive studies by NHTSA centered around "maximum feasible" levels of fuel economy improvement. The determination of feasibility includes consideration of technological feasibility, economic practicability, effects of other Federal standards, and energy conservation. Determination of feasible AFES levels for domestic and foreign auto manufacturers required different methodologies. The domestic modeling effort involved the following predictions: minimum feasible fleet-average inertia weight; minimum feasible fleet-average acceleration performance; maximum feasible fuel economy, based on 1977 levels of technology and emissions; and maximum feasible fuel economy, reflecting technological improvements and effects of other Federal standards. These predictions were made as a manufacturer-specific basis. The methodology for foreign fleet modeling involved obtaining baselines from EPA (Environmental Protection Agency) certification data for 1976-1977. Projected 1977 model year sales, manufacturers' fleet inertia-weight averages, and 1976-1977 fleet fuel-economy values

1978
Based on SAE-780682 "Passenger Automobile Fuel Economy Standards for 1981-84," by A. C. Mallin, R. L. Strombette, and S. R. Scheiner, presented at West Coast Meeting, San Diego, 7-10 Aug 1978.
Availability: See publication

HS-023 849

SMALL-CAR AIRBAG PERFORMANCE STUDIED

In order to investigate the performance of air bags designed for an advanced crashworthy structure in a small production vehicle, sled and full-scale crash tests were conducted by Dynamic Science Inc. on a 1976 Volvo 244 equipped with driver and passenger air bag systems developed for the Minicars RSV (Research Safety Vehicle). Both air bag systems employ dual bags, a pyrotechnic inflator, and a knee restraint, the driver airbag system incorporating an energy-absorbing steering column. The restraint systems performed well in the sled tests and the injury criteria of Federal Motor Vehicle Safety Standard (FMVSS) No. 208 were met in all cases. It was concluded that the systems could be expected to perform satisfactorily in crash impacts approaching 50 mph. The test vehicles for the full-scale crash tests were structurally modified to provide mounting hardware for the restraint systems and to maintain the structural integrity of the occupant compartment, particularly in the cowl area. Results of these tests are tabulated; data provided include impact conditions, velocity change, and occupant response (percent of FMVSS No. 208 injury criteria) for head, chest, and femur.

Publ: Automotive Engineering v86 n8 p36-8 (Aug 1978)
1978

Based on SAE-780679 "Performance of Advanced Passive Restraints," by Richard W. Carr, presented at West Coast Meeting, San Diego, 7-10 Aug 1978. Research sponsored by the National Hwy. Traffic Safety Administration.
Availability: See publication

HS-023 850

PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS

An analysis is presented of a range of largely non-construction congestion reduction techniques, applicable to peak-period traffic. A number of evaluations of the direct and indirect effectiveness, costs, timing, and feasibility of 22 major classes of promising techniques were performed. Based on this analysis, the following 17 techniques were evaluated as both effective and feasible in a U.S. institutional context: staggered work hours, road pricing, parking controls, traffic cells, auto-free zones, new towns, planned neighborhoods, zoning and building codes, transit marketing, carpooling and other ride sharing, communications in lieu of travel, freeway surveillance and control, maximum use of existing facilities, transit circulation, priority systems (arterial and freeway), and extended-area transit. None of these 17 offered more than marginal reductions in peak-period traffic congestion when applied individually. Some techniques offered so small a percentage of travelers that reductions in congestion would not be discerni-

similar to those of individual techniques were performed to determine how best to "package" or jointly implement promising techniques to optimize their combined effectiveness. It was found that all promising techniques could not be applied together because of conflicts in their impact. This analysis suggested the following eight sample packages or combinations of mutually supportive techniques: work-hour changes, pricing techniques, restricted access, changing land uses, prearranged ride sharing, communications substitutes, traffic engineering, and transit treatments. While the packages are merely examples of potential combinations, the evaluation methodology employed should be of continuing use to local transportation planners.

by Sandra Rosenbloom
Publ: Transportation v7 n2 p167-91 (Jun 1978)
Rept. No. NCHRP Proj. 710: 1978; 16cels
Sponsored by National Cooperative Hwy. Res. Prog. Based on NCHRP-169 "Peak-Period Traffic Congestion, Options for Current Programs", and "Peak-Period Traffic Congestion: State-of-the-Art" and "Recommended Research" by Robert Rasmak and Sandra Rosenbloom.
Availability: See publication

HS-023 851

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

Some of the unconventional measures for route control (route information, route advice, road pricing, access restriction, and route allocation) are reviewed, and consideration is given to whether a more positive approach to route control might be justified, by inducing a more efficient or acceptable pattern of traffic movement in urban areas. The principal criteria for an efficient pattern are taken to be the total rate of expenditure of vehicle mileage and the frequency of route crossings, and an attempt is made to evaluate the potential benefits of route control in these terms. The evidence available suggests that there is a very modest potential for reducing unnecessary travel distance on United Kingdom (U.K.) roads (up to about 5%), but that specifically in urban areas the potential for reducing route crossings could increase to 30%. Of the five basic categories of route control method considered, advisory systems involving road/vehicle communication such as the Tokyo experimental electronic route guidance system (ERGS) appear to offer worthwhile benefits, but other systems which are either self-contained within the vehicle or based on domestic equipment might well turn out to be cheaper in the long run. As other authors have shown, the use of signal timings to influence route choice in urban areas may have a great deal of potential without requiring a substantial investment in new technology. Similarly, the systematic use of turn restrictions and access restrictions to funnel traffic movement in urban areas would be relatively cheap, but the measures would perhaps be unpopular and the practical potential uncertain. Social, technical, and political considerations suggest that compulsory control will not be feasible for some time in the U.K. There appears to be a certain potential for various forms of route control, but the cost-effectiveness of the methods currently being developed cannot presently be predicted. The

Publ: Transportation v7 n2 p193-210 (Jun 1978)
1978; 19cels
Availability: See publication

HS-023 852

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. I: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

Research is reported which was designed to establish visibility requirements for roadway delineation that can be used to determine the cost effectiveness of various delineation treatments. The first research phase described is designed to determine experimentally the optimum and minimum visual roadway delineation treatments. The study addresses the issues of human factors requirements for adequate delineation visibility under adverse visual conditions (night, fog, or rain) and of the development of functional specifications for a methodology to assess highway marking contrast. Specific objectives of the study include developing dependent variables sensitive to roadway delineation treatment, establishing visibility requirements for such treatment, and determining luminance-contrast requirements for delineation. Tasks for accomplishing these objectives included a literature review and development of a theory for delineator visibility and driver perceptual requirements, driver simulator tests for validation of the theory under a wide range of conditions, and in-vehicle field tests to measure driver performance. The simulation and field test results were compared and analyzed through the use of the delineator visibility theory. A model was developed to quantify steering performance in terms of delineation contrast and configuration. In the simulator tests, lane position variability, preferred speed, and driver rating were similarly sensitive to delineation configuration and visual range. In the field tests, lateral lane position variability was sensitive to delineation contrast. Driver physiological response was also sensitive to rain conditions which affect delineation visibility. Delineation provides the visual perception input upon which driver steering performance depends. Steering performance is also affected by roadway geometry. High quality delineation (higher segment-to-gap ratios and shorter cycle lengths) offsets visual restriction due to roadway curvature. The performance models developed can be used in cost/benefit analysis with wear data from previous research to determine cost effectiveness of various delineation treatments. Further research is needed to determine whether improved delineation visibility under adverse conditions leads to higher vehicle speeds and degradation of traffic safety. Research is recommended on variations of segment-to-gap ratios and delineation cycle lengths. Minimum luminance-contrast requirements were found to be a value of two or higher, with 12 shown to be the highest achievable level. Practical field techniques for measuring roadway marking contrast are discussed.

by R. W. Allen; J. F. O'Hanlon; D. T. McRuer
Systems Technology, Inc., 13766 S. Hawthorne Blvd.,
Hawthorne, Calif. 90250
DOT-PH-11-8824
Rept. No. FHWA-RD-77-165; STI-TN-1065-1; 1977; 214p
62cels
Vol. 2 is rept. FHWA-RD-77-166. Partly subcontracted to
Human Factors Res., Inc.
Availability: NTIS

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

Emissions and fuel economy have been measured for two years on a group of 56 catalyst-equipped cars (1975/1976 model year) in consumer use and maintenance. Data collected during this study are tabulated and discussed and include idle CO (carbon monoxide); mass emissions of HC (hydrocarbon), CO, NO_x (nitrogen oxides), sulfate, and SO₂ (sulfur dioxide); and fuel economy. Test cycles used were the 1975 FTP (Federal Test Procedure), one hour 50-mph cruise, CPDS (Congested Freeway Driving Schedule), and HPET (Highway Fuel Economy Test). Fuel economy data are also presented for the same vehicles for over-the-road driving from on-board totalizing fuel and engine hour meters on each car. Deceleration SO₂ emissions characteristic of two identifiable modes of carburetor tune are discussed. Catalyst activity was measured at idle, 30 mph, and 50 mph by exhaust sampling before and after the catalyst. Although 70% of the catalysts were established to be active at 30 mph and 50 mph, catalyst activity at idle was observed to be much lower when CO was greater than 1%. Study results emphasize the influence of maintenance (tune-ups) on emissions. There was surprising indication that most converters were still active at the end of the study, in spite of misadjusted carburetors. This is partially due to the converters' inability to react to high CO input loadings. Depression of oxidative capacity by high CO is less apparent in air pump equipped vehicles (mainly Fords). Over-the-road fuel economy for test group vehicles is significantly lower than laboratory measurements would project. Future research will center on fuel economy features such as engine family, inertia weight, seasonal variations, maintenance, and emissions.

by R. E. Gibbs; G. P. Wotzak; B. J. Hill; T. M. Hussey; R. E. Johnson; M. A. Moore; P. L. Warner; S. M. Byer
New York State Dept. of Environmental Conservation, Div. of Air Resources, Albany, N.Y.
EPA-603/30-01-0
Rept. No. SAE-780645; 1978; 28p 18refs
Technical Paper Series. Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jun 1978. Research sponsored in part by New York State Automotive Res. Funds.
Availability: SAE \$2.50

GASOLINE: MORE MILES PER GALLON

Information is presented to help automobile owners select gasoline with proper octane rating for their cars, and to obtain optimum mileage and performance from the gasoline. Explanations are given on how gasoline producers power and how its components are blended. The importance of keeping an automobile engine properly tuned is stressed, and practical fuel economy tips are listed.

Department of Transportation, Office of Public and Consumer Affairs, Washington, D.C. 20590
Rept. No. DOT-P-6170.1; 1977; 12p
Availability: Consumer Information Center, Pueblo, Colo. \$1.00

FUNDAMENTALS OF TWO-WHEELED TRAFFIC. PT. A: DOCUMENTATION OF TWO-WHEELED

TRAFFIC FOR SPECIFIC MOTORIZED VEHICLES OVER 50 CC. PT. B: RECOMMENDATION ON A CHANGE IN DOMESTIC REGULATIONS FOR LIGHTWEIGHT MOTORCYCLES AND MOTORIZED BICYCLES (GRUNDLAGEN ZUM ZWEIRADVERKEHR. TEIL A: DOKUMENTATION UER DEN ZWEIRADVERKEHR AUSGENOMMEN KRAFTRADER UBER 50 CCM. TEIL B: STELLUNGNAHME ZU EINER ANDERUNG DER NATIONALEN VORSCHRIFTEN FUR KLEINKRAFTRADER UND FAHRRAEDER MIT HILFSMOTOR)

Data available on two-wheeled traffic in the Federal Republic of Germany are summarized in Part A, including statistics on ownership, price ranges, mileage, driver age and sex, accident figures, and availability of special paths for two-wheeled vehicles. Other data are presented on vehicle technology, road construction and traffic technology, as well as a bibliography of laws, guidelines, and publications which deal with bicycle path construction and traffic systems. Availability of insurance on two-wheeled vehicles is summarized and a bibliography presented on such research and development topics as accident causes, behavior descriptions and studies, and technical studies. Driver education for cyclists of motorized and unmotorized vehicles is summarized, including an extensive bibliography of multimedia instructional material, test regulations, and legal codes. Addresses are provided of associations connected with two-wheeled vehicle manufacture, operation, and regulation. Part B presents recommendations for a revision of national regulations, especially speed limits, for two-wheeled vehicles. A design-determined speed of 70 km/hr for lightweight motorcycles is recommended as a replacement for the current 50 cc stroke volume limitation. This speed limit would have greater driver acceptance, would permit these vehicles to use the autobahn, and would make green light synchronization possible. Inspection for noise level and exhaust emissions is also recommended, as is required helmet use by all drivers of motorized two-wheeled vehicles with design speeds over 25 km/hr. Driver proficiency tests are also recommended, including theoretical and practical aspects. An extensive bibliography is provided.

by H. op de Hipt; H. Loeffelholz; P. Nicklisch
Publ. Unfall- und Sicherheitsforschung Strassenverkehr 97 (1977)
1977; 227p refs
Sponsored by Federal Traffic Ministry, Federal Traffic Inst., Accident Res. Dept., Cologne, Germany. Text also in German.
Availability: Reference copy only

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

Current methods of conducting traffic safety studies (clinical, statistical, and experimental) are evaluated and found inadequate. The literature was reviewed on traffic safety studies at intersections involving two-wheeled vehicles in other countries, including research on the functions and malfunctions of the traffic system involving cyclists and pedestrians. From this information, a preliminary field observation methodology was

system's malfunction (observation of the conflicts). Results of initial observations at four of 15 intersections studied are presented. The initial series of results will be used to further develop the method and simplify the study design.

by C. Tétard
Organisme National de Sécurité Routière, France
Rept. No. DSR/ONSER-228; 1976; 118p 14refs
Text also in French. DSR/ONSER 1975 Study Agreement,
Objective No. 6, Fourth Phase, Final Rept.
Availability: Reference copy only

HS-023 857

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

The direction being taken and the progress to date of an SAE (Society of Automotive Engineers) task force to study the under-vehicle corrosion of coated steels in a deicing salt environment, are reported. The task force, formed on 7 Oct 1975, consists of members from three American auto manufacturers and ten American and Canadian steel manufacturers. The goal of the task force is to develop an SAE Recommended Practice on a method for testing the corrosion resistance of coated steels in an undervehicle deicing salt environment. It is intended that suppliers will use this test to rank candidate coatings. Current lab tests are felt to lack correlation with actual field performance. The technique chosen by the task force involves coated coupons mounted under vehicles; a specific coupon geometry and location have been chosen. A round-robin testing program to verify the proposed standard test and to generate a data base is underway. Since the program is in an early stage, results and conclusions are unavailable.

by R. J. Neville
Dominion Foundries and Steel Ltd., Canada
Rept. No. SAE-770364; 1977; 8p 5refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 858

THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM

The technical development of three-way catalysts (TWC's) is described with their catalytic and durability characteristics as a function of fuel lead (Pb) concentration, total precious-metal loading, and platinum (Pt) and rhodium (Rh) concentrations. When the TWC's were aged on representative 1977 unleaded commercial fuel, they had higher conversion efficiencies and improved durability than catalysts aged on modified 1975 FTP (Federal Test Procedure) specification fuel containing approximately 0.025 g/gal Pb and low levels of phosphorus (P). As the Rh content was increased in a series of Pt-Rh TWC's, the maximum conversion efficiency and durability increased, and the mine recovery ratio of Pt/Rh was found to be most susceptible to Pb poisoning. However, good NOx (nitrogen oxide) efficiencies can be obtained from mine recovery ratio

show beneficial effects in increasing the precious metal loading above 15 g/oz Cu.

by J. J. Mooney; C. E. Thompson; J. C. Dettling
Engelhard Minerals and Chemicals Corp., Engelhard Industries Div., Menlo Park, N.J. 08817
Rept. No. SAE-770365; 1977; 15p 10refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 859

CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION

Multifunctional catalysts for three-way catalyst (TWC) systems are discussed in general. The basic working principles of the catalysts (good activity at or near the stoichiometric point for oxidation of hydrocarbons (HC) and carbon monoxide (CO) and simultaneously for conversion of nitrogen oxides (NOx) to nitrogen (N₂) are outlined, as are the different types of catalysts, their support materials (alumina, cordierite) and active phases (precious metals, nonprecious-metal oxides, precious metal/oxide). Test methods for characterizing activity and stability of the catalysts (model gas test, standard EPI engine exhaust gas test) are described. Catalyst characterization is discussed in terms of activity (conversions of HC, CO, and NOx vs. A/F (air-fuel ratio), low-temperature activity) and stability (thermal aging, poisoning). Results are summarized for activity tests of Rh (rhodium) containing catalysts aged by different methods (treated with hydrogen, 0.5 hr, 600 degrees C; heating in air, 0.5 hr, 800 degrees C), and surface studies of the catalysts after such tests. It is concluded that the considerable differences in Rh oxidation states and in their concentrations detected in the surface studies will also be reflected in the catalytic effective surface (as demonstrated in the activity tests which showed a reduction in activity for Rh-containing catalysts aged in air).

by E. Koberstein
Degussa-Wolfgang, Germany
Rept. No. SAE-770366; 1977; 14p 6refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 860

THE ROLE OF RHODIUM IN RH/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

General observations are reported from research over the past two years on a series of Rh (rhodium)/Pt (platinum) catalysts employed both for control of CO (carbon monoxide)/HC (hydrocarbon) under oxidizing conditions, and for simultane-

ous control of CO/HC/NOx (nitrogen oxides) in the three-way catalyst (TWC) system. In general, Rh/Pt catalysts show much greater ability to convert NOx under TWC conditions, and produce lower sulfate emissions under net oxidizing conditions. On the other hand, Rh/Pt can show lower HC conversion and durability than other noble metal combinations when operated under vast excess of oxygen. Surface studies (scanning electron microscopy and X-ray photoelectron spectroscopy) have revealed that these effects can be attributed in part to surface enrichment of the Rh/Pt system by the Rh component. This is followed by oxidation which produces durable surface species which are inactive to sulfate formation, and reduces the activity of the catalyst to HC conversion. The role of such species in the conversion of NOx is discussed, and possible solutions to this problem are outlined in terms of catalyst design criteria.

by B. J. Cooper; B. Harrison; E. Shott; F. Lichtenstein
Johnson Matthey Res. Centre (U.K.); Mersey Bishop Inc.
Rept. No. SAE-770367; 1977; 14p 21refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 861

EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS

In an effort to obtain general guidelines which could be used for formulating a practical three-way catalyst (TWC), platinum (Pt), palladium (Pd), and rhodium (Rh) were tested as catalytic ingredients for three-way conversions, and silica, alumina, and silica-alumina were tested as support materials. Catalysts were evaluated fresh, after in situ hydrothermal aging at 816 degrees C, and after cyclic pulsator aging at 538 degrees C (2 hr) and 704 degrees C (1 hr) using a fuel containing Pb (lead), P (phosphorus), and S (sulfur) poisons. All samples exhibited good three-way conversions of CO (carbon monoxide), HC (hydrocarbon), and NOx (nitrogen oxides) when fresh. It was concluded that silica is a poor support candidate for noble-metal TWC's. Silica-alumina supports are hydrothermally stable but lack poison-resistance compared to pure alumina. The most suitable support for noble-metal TWC's appears to be alumina.

by Guan Kim; James M. Maselli
W. R. Grace and Co.
Rept. No. SAE-770368; 1977; 8p 8refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 862

UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS

A study was undertaken of three-way catalysts to determine the potential for new tailpipe contaminants produced by the system in order to evaluate perceived environmental risks. Since the first commercial use of three-way catalyst technology was made in the 1977 California Volvo, much of the work was performed with this car. A significant amount of data was also obtained from oxidation catalysts run under reducing conditions and from a variety of other domestic and foreign cars, in order to place the three-way data in better perspective. It

was concluded that current production three-way cars, operating normally, produce no significant amounts of sulfate, HCN (hydrogen cyanide), NH3 (ammonia), H2S (hydrogen sulfide), or COS (carbonyl sulfide) and that N2O (nitrous oxide) is a minor product. Oxygen sensor feedback systems are capable of partially correcting very major upsets in mechanical tune. With oxygen sensor failure, a variety of unregulated emissions can be expected, depending on the position of mechanical control of mixture strength. Lean-failure of three-way systems can produce sulfate to about the same extent as catalyst cars. Rich-failure produced HCN, NH3, H2S, and COS. High-speed steady states produce maximum yields of HCN in simulated rich-failures. Finally, it was concluded that rhodium (Rh)-containing catalysts are very much more efficient in producing these products than are platinum (Pt)-palladium (Pd) catalysts. The data on the role of NO (nitric oxide) concentration were inconclusive. A better understanding is needed of the quantitative relationships among the reaction mechanisms of NO reduction, water-gas shift, ammonia, N2O and HCN formation in real emissions control systems.

by Ronald L. Bradow; Fred D. Stump
Environmental Protection Agency
Rept. No. SAE-770569; 1977; 10p
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977. References
indexed but not supplied.
Availability: SAE

HS-023 863

A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC VEHICLES

A new nickel-zinc (Ni-Zn) battery is described, with energy densities of 50 Ah/kg-80 Ah/kg depending on the choice of nickel cathodes. (Before far-term, high-energy electric on-road vehicle (REV) batteries will have been developed, near-term, lead-acid and intermediate batteries with energy densities of 40 Wh/kg-60 Wh/kg can meet the energy demands of a large number of commuter and delivery cars.) The new Ni-Zn battery uses a vibration charging technique which completely eliminates Zn dendrite formation and shape change with the life of the battery being determined by the nickel cathodes. Practical tests with deep-cycling during four years of a 2 kW Ni-Zn battery have confirmed these results. Traction cells up to 150 Ah have been field-tested in vehicles. With this type of Ni-Zn battery with vibrating electrodes, energy densities from 60 Wh/kg up to 90 Wh/kg seem possible if high-capacity, long-life Ni cathodes can be developed. Equivalent driving ranges in urban traffic are 120 km-180 km. These batteries, using soluble Zn anodes and simple plastic nets as separators, can to a large extent be produced by mechanical industry. The lifetime/kWh cost of these batteries can be low due to possible lifetimes of 2,000 cycles or more.

by Otto Von Krausentierne; Muts Reger
AGA A.B., Innovation Center, Sweden
Rept. No. SAE-770384; 1977; 11p 12refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 864

CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE

specifications, and performance of the Daihatsu HS40V electric cab-van are discussed, as well as its quick-charging system.

by Shoji Honda; Masahiro Sugimoto; Ichiro Yamoto; Shiro Kawakatsu
Daihatsu Motor Co., Ltd., Japan
Rept. No. SAE-770385; 1977; 15p
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 865

ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS

An electric milk delivery car, using lead-acid batteries as the power source, has been in service in Japan for about four and one-half years. More than 20,000 km, a reasonable figure, were obtained within the life of a single battery. It was found that battery handling is as important as battery performance in the actual use of an electric car. To achieve the best use of an electric car, further effort is required, especially in developing an easier, more foolproof battery handling system to avoid the problems of forgetting to charge the batteries, overcharging and failing to fill the batteries with water.

by T. Nagano; O. Maegawa; K. Kamada; I. Okazaki
Japan Storage Battery Co., Ltd., Japan
Rept. No. SAE-770386; 1977; 8p 3refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 866

BATTERY POWERED JEEP AND VAN PERFORMANCE

Two electric vehicles, a postal jeep and a commercial delivery van, were tested as part of a joint program by the U.S. Postal Service and U.S. Army to evaluate the performance of electric vehicles. Energy data from operation over a test loop and various grades are presented for zero to 15 mph start/stop and 30 mph range runs. Test results are summarized in a graph for prediction of remaining miles based on route terrain. Jeep regenerative braking is discussed. A high-power electrical simulator was used to reproduce a mountainous terrain load profile. The simulator which was programmed with magnetic tapes made up from actual field recordings, verified calculations.

DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION

Development of high-performance electric vehicles has been pursued both by simple conversions from standard gasoline vehicles, and by designing a purpose-built vehicle in the form of a taxi incorporating novel features. By combining the lower cost of the former method with the greater efficiency of the later, the Mark III Lucas electric vehicle has been evolved based on a standard van, providing one-ton payload capacity. The compact drive package can be fitted to a variety of vehicles at the initial manufacturing stage. Much of the servicing of the new electric vehicles can be done by existing manufacturers' service networks, but the supply and maintenance of batteries will require proper implementation, best performed in fleet operation. The development of the Mark III concept as an addition to the range of standard vehicles available brings very much closer the introduction of electric vehicles manufactured in quantity. A limousine and luxury crew bus have been built as passenger adaptations of the electric vehicle. One advantage of an electric drive is its use in locations where internal combustion engines are not allowed: the interior of food warehouses and supermarkets, postal sorting offices, and hospitals.

by O. G. Harding
Lucas Batteries Ltd., England
Rept. No. SAE-770388; 1977; 12p 2refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 868

THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS

A series of wind-tunnel tests was performed with a 1/8-scale semi-detailed model of a notchback sedan in order to investigate the details of flow-field effects produced by "Spoilers" (front-underbody and rear-deck lips) on a conventional automobile body shape. Force and moment measurements were augmented by measurements of model exterior, engine compartment, and ground-plane surface pressure and by flow visualization experiments. It was determined that lift and drag reductions produced by dams are primarily a result of front-underbody and engine compartment pressure reductions. These pressure reductions are a consequence of the downward deflection and the acceleration of the flow entering the underbody/ground-plane gap at the front bumper. Front lift reductions with a dam are primarily a result of decreases in front-underbody and underhood surface pressures. These improvements are partially offset by decreases in hood and

windshield pressures. Drag reductions occur primarily on the engine compartment rear bulkhead, toe pan, front suspension and crossmember, and engine. By virtue of their relatively large size, the engine compartment's rear bulkhead/toe pan areas produce the largest increment of drag reduction. Depending on dam size, drag decreases are partially or completely offset by drag increases at the dam, radiator, and model exterior. Rear-deck lips produce drag and rear lift reductions primarily by increasing the surface pressures on the backlight, rear deck, and the rear half of the roof; and by reducing the pressures on the rear half of the underbody. The rear surface pressure rise is due to the reduction in rear flow-field curvature as the lips deflect the vortex-generated downwash flow. The net drag change due to rear-deck lips is primarily a result of the opposing trends of drag reductions on the backlight and rear-deck surfaces and drag increases on the lip and rear-underbody area.

by Franz K. Schenk
General Motors Corp.
Rept. No. SAE-770389; 1977; 14p 9refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 869

THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD

An evaluation of a first-order "panel" method to predict the pressure distribution on a bluff van-type vehicle body is presented. Two cases are considered, a single vehicle with and without cross-wind and the overtaking process of two identical vehicles, the latter being treated as quasi-stationary. The theoretical model incorporates simulation of the ground and van wake, the geometry of which is based on experimental information. Extensive pressure measurements on 1/4-scale models in a wind tunnel are compared with the theoretical study results. For situations where the flow remains attached over the body surface, the pressure distribution is predicted fairly well. Flow separation near van base or on the sides under conditions of yaw cannot be considered by the present ideal fluid attached-flow model. The agreement between theory and experiment, although encouraging, is not of a degree to enable accurate predictions of forces and moments. The main deficiency of the theoretical model is the inadequate representation of the effects of friction which play an important role in vehicle aerodynamics. What is essentially lacking is knowledge about the basic flow mechanisms about bluff bodies which include the following: the development of boundary layer over body surface; the interdependence of wake and body shape; formation, location, and orientation of free vortices from shoulders and roof edges; criteria to locate regions of separated flow and their geometrical extent; interference phenomena between boundary layer, wake, and vortices of two neighboring vehicles; and flow between vehicle and road and its correlation with other flow regions. If sufficient generally-applicable basic knowledge about the flow mechanism is available, an extension of the inviscid flow model to incorporate these phenomena appears feasible. Characteristic advantages of the theoretical method proposed are its extreme flexibility to represent complicated, realistic vehicle body shapes, ability to treat unsteady phenomena, and the relative ease and economy of application as compared to

other theoretical and experimental methods presently applied in vehicle aerodynamics.

by S. R. Ahmed; W.-H. Hucho
Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Germany; Volkswagenwerk A.G., Germany
Rept. No. SAE-770390; 1977; 24p 15refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 870

TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND

In order to investigate the cross-wind characteristics of passenger cars, vans, buses, and car-trailer combinations, transient side forces and yawing moments were measured by using 1/10-scale models of these vehicles in wind tunnels. In the past, investigations of the dynamic performance of vehicles using scale models have rarely been attempted. This study clarified that the model experiment is an effective method of analyzing the dynamic behavior of vehicles in cross-wind. It is concluded that it is better to treat the data with one parameter for relative yaw angle rather than with two parameters (wind velocity and velocity of model cars). It was found that the position at which the transient yawing moment coefficient changes from positive value to negative tends to decrease linearly as the relative yaw angle increases. It may therefore be necessary to consider the front body shape in addition to the side body profile in order to design a vehicle to be stable in cross-wind. It is concluded that the existence of a trailer does not influence the transient side force and yawing moment on the tractor when the trailer is out of the cross-wind but gradually as the trailer enters into the cross-wind, this influence becomes greater.

by Yasushi Yoshida; Shiro Muto; Tetsuo Itoizumi
Japan Automobile Res. Inst., Inc., Japan
Rept. No. SAE-770391; 1977; 16p 10refs
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A, SITE SELECTION AND DATA COLLECTION. FINAL REPORT

Details are presented of the site selection and data collection processes involved in evaluation of roadway delineation treatments. Criteria for site selection included availability of state records, wide geographic distribution, and broad range of site types and delineation practices. Site data included geometric data, roadway environment features, historical travel volumes, and delineation characteristics such as form, application, and maintenance practices. Much of these data were obtained by field review. Accident data were computerized in the form of a summary of each accident and organized to provide a history of accident occurrence at the selected sites. It was found that the differing data formats made it difficult to conduct traffic

provide inventories of traffic signs, pavement markings, surface types, etc., and to provide visual reference for illustrating accident reports and designs for new highway facilities, and for responding to citizen concerns.

by S. Ball; R. Potts; J. A. Fee; J. I. Taylor; J. Glennon
Science Applications, Inc., 1200 Prospect St., La Jolla, Calif.
92038
DOT-PH-11-4587
Rept. No. FHWA-RD-78-52; 1978; 63p
Rept. for Jan 1975-Mar 1978, Vol. 1, Executive Summary, is HS-023 839; Vol. 2, Final Report, is HS-023 840; Vol. 4, Appendix B, is HS-023 841; Vol. 5, Appendix C, is HS-023 842; Vol. 6, Appendices D and E, is HS-023 903.
Availability: NTIS

HS-023 903

**COST-EFFECTIVENESS AND SAFETY OF
ALTERNATIVE ROADWAY DELINEATION
TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 6. APPENDICES D AND E, COST
OF ROADWAY ACCIDENTS AND COST AND
SERVICE LIFE OF ROADWAY DELINEATION
TREATMENTS. FINAL REPORT**

Appendix D discusses various alternative items of accident cost and presents the rationale for using specific accident cost data. Major difficulties in estimating accident cost are the identification of specific elements and attaching dollar values to these elements; both processes are accompanied by controversy. A brief history is presented of attempts at quantifying accident cost, including separation of direct and indirect costs. Total indirect costs were estimated at \$5.5 and \$6.4 billion in 1969, including accident prevention (13%-24%); insurance "fixed" costs (35%-40%); police, courts, and motor vehicle agencies (20%-35%); and public and overhead costs (less than 1%). The specific cost items in this report include property damage, medical costs, productivity losses (future earnings), insurance administration, losses to other individuals, employer losses, funeral costs, community service, pain and suffering, and miscellaneous neckless costs. Cost estimates are categorized according to level of severity and represent overall monetary value lost in roadway accidents (\$2800 per average accident). Appendix E discusses the cost and service life of delineation treatments, including pavement stripes (painted and thermoplastic) and raised pavement markers. Costs associated with traffic interruption are discussed, including delay to in-

HS-023 906

**LE DEUX ROUES. REVUE DE LA LITTERATURE
FRANCAISE ET ETRANGERE (TWO-WHEELED
VEHICLES. A REVIEW OF FRENCH AND FOREIGN
LITERATURE)**

Studies on two-wheeled vehicles from the U.S., Japan, and western Europe are summarized and discussed. Vehicle types include bicycles, mopeds, motorbikes, and motorcycles. Statistical data are provided on numbers and percentages of each type of two-wheeled vehicle compared to those of four-wheeled vehicles, mileage covered, uses, and accident rates, including fatalities and injuries. Accident causes for these vehicles are discussed, as are the ergonomics of the drivers. Regulation, training, and education measures for improving the safety of two-wheelers are considered. It is concluded that accident prevention measures applicable to four-wheeled vehicles are not always appropriate for two-wheelers. Fairly training for cycle riders is recommended, with the training tailored to the population (children or adults).

by C. Tesson
Rept. No. ONSER-203; 1975; 115p 63refs
Text also in French.
Availability: Reference copy only

HS-023 907

**ASSESSMENT OF THE EFFECT ON TRAFFIC
ACCIDENTS OF THE LOWERING OF THE LEGAL
DRINKING AGE IN ILLINOIS**

Statistics on known drivers in fatal accidents in Illinois for 1971-1972 (before reduction of the legal drinking age from 21 to 19), when compared to those of 1974-1975 (after the drinking age reduction), indicate a rapid rise in involvement of teenage and young drivers (ages 15-24), but the greatest relative increase has been in involvement by 19 to 20-year-old drivers. Fatal accident involvement of known drivers aged 25 or above has decreased for the latter period, due in part to reduced speeds and travel during the gasoline shortage. Vehicle registration statistics indicate increased driving exposure of younger drivers. Blood alcohol content of drivers killed in accidents showed that alcohol abuse is most prevalent in drivers in their twenties and thirties, although alcohol abuse is widely evidenced throughout the state's driver population. Drivers from the ages of 19 to 44 have higher involvement rates for alcohol than fatalities. The evidence does not support the con-

clusion that lowering the drinking age had a major negative effect on accident involvement by drivers aged 19 and 20.

Illinois Div. of Traffic Safety, Evaluation and Data Analyses
Section, Springfield, Ill.
Rept. No. PI-375 837; 1976; 26p
Availability: NTIS

HS-023 908

AMBIENT TEMPERATURE AND TRIP LENGTH- INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS

The interrelationships among automotive fuel economy, ambient temperature, cold-start trip length, and drive-train component temperatures of four 1977 vehicles were examined. Fuel economy, exhaust emissions, and drive-train temperatures were measured at temperatures of 20 degrees F, 45 degrees F, 70 degrees F, and 100 degrees F using the 1975 Federal Test Procedure and the Environmental Protection Agency's highway fuel economy test. Results showed that vehicles used for short cold-start trips consume fuel at a much greater average rate than during long trips, and the effect is magnified with decreasing ambient temperature. Carbon monoxide (CO) and hydrocarbon (HC) pollutant emissions are also significantly influenced by ambient temperatures and by trip length. The CO emissions rate for short, cold-start trips at 20 degrees F was over 15 times the reference rate; at 70 degrees F, it was about three times the reference rate, and at 100 degrees F, only twice the reference rate. Longer trips (20-30 mi) at 70 degrees F decreased CO emissions to one-half the reference rate. Similar effects were noted on HC emissions, but with reduced sensitivity to ambient temperature and trip length. Only slight sensitivity to these factors was noted in measurements of nitrogen oxides (NOx) emissions. Use of an air conditioner (AC) at 100 degrees F appeared to reduce fuel economy by 10% over 70 degrees F fuel consumption without AC. Different warm-up rates (time to reach 95% of equilibrated temperature) were recorded for engine oil (15 mi), transmission (16 mi), and differential (22 mi).

by H. E. Eekelton; R. W. Harn
Department of Energy, Bartlesville Energy Res. Center,
Bartlesville, Okla. 74003
Rept. No. SAH-780613; 1978; 16p Reels
Technical Paper Series. Presented at Passenger Car Meeting,
Troy, Mich., 5-9 Jan 1978. Research sponsored by Dept. of
Transportation, Transportation Systems Center, Kendall
Square, Cambridge, Mass. 02142.
Availability: SAE

HS-023 909

GUIDE TO HIGH SPEED PATROL CAR TIRES

This user's guide is designed to supply the information needed to select tires for police pursuit cars and to maintain them for maximum safety, tire life, and performance. Information is presented in the following sections: application aspects (types or roads driven, pursuit driving, tire maintenance, hazard exposure, types of tires used, tire mileage, snow tires); technical aspects such as construction (bias-ply, bias-belted, radial), tire markings, tire materials, use of chains, positioning of least worn tires, tires and gasoline mileage; selection and purchase of tires, including principles of selection, cost factors, and performance (braking traction, cornering traction, driving trac-

tion, installation (mounting tires on wheels, inflation pressure, radial run-out, balancing, alignment, safety precautions), operations (break-in, inflation and loading, road conditions, driver habits, mechanical condition of vehicle), and maintenance (inflation checks, tire rotation, detection of faults and impending troubles, abnormal tread wear, repairs and servicing, mixing and matching tires, snails vs. snow tires).

by Alvin C. Lewis; Ernest Lewis, Jr.
National Bureau of Standards, Law Enforcement Standards
Lab., Washington, D.C. 20234
Rept. No. NBS-SP-480-33; 1978; 65p 12reels
Sponsored by National Inst. of Law Enforcement and
Criminal Justice. Law Enforcement Equipment Technology
Series.
Availability: GPO

HS-023 910

TRAFFIC CONFLICT SURVEYS: SOME STUDY DESIGN CONSIDERATIONS

The traffic conflicts technique, a device for the indirect measurement of road safety which involves the conduct of a field survey to count conflict occurrence and an estimation of the rate at which conflicts occur based on field data, is considered in terms of the accuracy of such estimation and its dependence on the design of the field survey. Present practice in conflict count duration is reviewed, and the relationship between count duration and estimation accuracy is examined. Using data from several sources, the daily variability of conflict counts is described. It is concluded that the expected conflict rate varies from day to day. Use of the negative binomial distribution is suggested as appropriate for the representation of the distribution of sample means obtained from conflict studies. On this basis, confidence limits and probabilities of Type I errors (concluding on the basis of data that the treatment is effective when in fact it is useless) and Type II errors (maintaining on the basis of empirical evidence that the treatment has no effect while in fact it is useful) in hypothesis testing are obtained and tabulated. Their use in study design is illustrated by numerical examples. Accuracy increases with survey duration, but the increase in accuracy per additional survey day diminishes rapidly. There is little to be gained by counting longer than three days. This establishes a practical limit to the accuracy with which expected daily conflict rates can be estimated.

by E. Hauer
Transport and Road Res. Lab., Road User Characteristics
Div., Crowthorne, Berks., England
Rept. No. TRRL-SR-332; 1978; 34p 15reels
Availability: Corporate author

HS-023 911

THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT

An overview is presented of the major findings from a comprehensive national study using probability techniques and procedures which provide quantified information on the transportation handicapped population in urban areas of the U.S. This effort is the first step in a multiphased program undertaken in response to Congressional interest in and legislation for the planning and design of mass transportation facilities to meet special needs of the elderly and handicapped. The

composition of the urban transportation handicapped population, their travel behavior, transportation barriers, latent travel demand and transportation solutions. Of the transportation solution alternatives surveyed, the combination of separate door-to-door service and individual subsidies was found to be more attractive than other combinations involving an accessible fixed route system. A complete Technical Report and Technical Appendix are being developed and will be issued during the second half of 1978.

Gray Advertising Inc., New York, N.Y.
1978; 98p 1ref

Sponsored by Urban Mass Transportation Administration.
Cover title: Summary Report of Data from National Survey of Transportation Handicapped People.
Availability: Urban Mass Transportation Administration, Service and Demonstration Prog., Washington, D.C. 20590

HS-023 912

THE HANDICAPPED DRIVER'S MOBILITY GUIDE

Descriptive listings of driver training facilities for the handicapped are presented, as well as listings of adaptive equipment manufacturers, and organizations that provide services to handicapped drivers. Vehicle selection is discussed, with emphasis on ease of access. Two-door automobiles are generally more accessible for the handicapped person who requires no assistance; otherwise a four-door car may be more convenient. An intermediate or larger size car may be required to provide room for adaptive controls. Sources of van modifications to accommodate the handicapped are listed. Factory options which may benefit handicapped persons are discussed, as are modifications to be added. It is recommended that purchased hand controls meet Veterans Administration standards (list of manufacturers provided). Tips are presented on equipment installation and maintenance, driving, insurance, and parking.

by John De Lellis
American Automobile Assoc., Traffic Engineering and Safety Dept., Falls Church, Va.
Rept. No. AAA-3772; 1978; 51p refs
Availability: Corporate author

HS-023 913

HOW TO DRIVE. REVISED ED.

Advanced information is provided to the beginner and to the experienced driver on learning to search the traffic scene, methods for managing time and space in moving traffic, and planning an immediate and alternate path of travel. Guides are provided for vehicle maintenance, and the importance of emotional and physical fitness is emphasized, including the effects of alcohol and other drugs. Traffic controls, signals, signs, and markings are explained. Methods are provided for meeting emergency driving situations, and special driver skills needed for towing a trailer are outlined. A concluding chapter deals with procedures to be carried out in case of collision, and with types of insurance coverage.

by Francis C. Kenel; John D. De Lellis
American Automobile Assoc., Traffic Engineering and Safety Dept., Falls Church, Va.
1978; 201p
Availability: Corporate author, stock no. 3502

HS-023 914

AIR CUSHION RESTRAINT SYSTEMS, A BIBLIOGRAPHY

This bibliography of on-line and manual search items is presented under 25 subject headings, including deployment case reports, injuries caused by air cushion restraint systems (ACRS), deployment factors (force, noise), inflation devices (time, pressure), costs, design, effectiveness, failure, and legal factors. Other topics include loading, modeling, patents, standards, tests, and weight. Air bags constitute one subject heading and crash sensors another. Comparisons of restraint systems and vehicle design changes are the concluding topics. Bibliographic data are provided, but not abstracts. These are available through the corporate author.

by Neil K. vanAllen
General Motors Res. Labs., System on Automotive Safety Information, Warren, Mich. 48090
Rept. No. GMR-2750; SAE-78-1087; 1978; 512p refs
Availability: Corporate author

HS-023 915

TRUCKER'S GUIDE TO FUEL SAVINGS

The following sections provide the truck driver involved in line-haul operations with information on fuel economy: "Why save fuel?"; "Are significant savings possible?"; "A little theory on power?"; "Keep your engine 'tuned'"; "Check the chassis"; "Increase your payload"; "Reduce truck frontal area"; "Use radial tires or wide base singles"; "Streamline your truck"; "Consider using a temperature-modulated fan"; "Consider using single drive axles"; "Add turbocharging kits"; "Derate the engine"; "Reduce engine speed (rpm)"; "Drive slower"; "Optimize your engine, transmission, axle"; "A special note to drivers"; and "Conclusion: how much fuel savings are practical?"

Cummins Engine Co., Inc., Columbus, Ind. 47201
Rept. No. Bull-952886; 1973?; 21p 1ref
Availability: Corporate author

HS-023 916

CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS

A summary is presented of data collected during 98 trailer-visits (64 trailers) between 19 Aug 1974-15 Apr 1977 at the Central Field Test Center (CFTC) and the Eastern Field Test Center (EFTC), utilizing the Primary Reference Surfaces (PRS) for the purposes of calibration of skid measurement systems. An attempt was made to assess the need for inventory units to be recalibrated and to determine at what frequency such recalibration should occur. It is concluded that to keep one out of ten inventory units within reasonable "standards", these units should be recalibrated approximately once per year. If it is allowable for 25% to 35% of the units to fail to meet the standards, the units can be recalibrated approximately every two years. Elapsed time between calibrations seems to be related more to system change than does any other measure of system use (e.g. number of wheel lock-ups, drives miles), although some of these measurements are interrelated. Inter-unit variance (accuracy) measured at the annual calibration SN (skid number) average was about 10 SN squared on

arrival and 7 SN squared in exit condition. Exit condition values were smaller for units returning for a second and third time (4 SN squared). These values are consistent with those found at Penn State (1974). Intra-unit variance (precision) averaged about 7 SN squared on arrival and 5 SN squared in exit condition. Seventy-nine percent of all trailers improved in the exit condition when compared to arrival. Speed and water flow rate average errors were large in the "arrived visit 1" condition, with deviations reducing upon return visits. Average horizontal calibration values were in greater error than vertical averages. Accuracy degraded as "time since last visit" increased, approaching the "as-arrived first visit condition" when elapsed time averaged 24 months. Based on the relationship between elapsed time and performance, estimates of the time between visits required for the average performance to degrade to a point equivalent to visit 1 "arrival" condition vary from 14 to 32 months between visits (vertical calibration values, SN change in the calibration curve) to 32 months (horizontal calibration values). These represent average values across units, and considerable deviation from these values exist for individual units. Two calibrations, conducted ten months (and 2000 miles) apart indicated the two Area Reference Skid Measurement Systems (ARSMS) had an average difference in the two calibrations of 0.1 SN.

by J. Neuhardt; E. A. Whitehurst; M. Golligly
Ohio State Univ., Res. Foundation
Rept. No. PIITA-TS-78-224; Transplex/OSU-156; 1978; 138p
Iref
Availability: Federal Hwy. Administration, Office of Res. and Devel., Implementation Div., Washington, D.C. 20590

HS-023 917

MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT (METHYL TERTIARY BUTYL ETHER)

Methyl tertiary butyl ether (MTBE), currently used in Europe as an octane enhancer, is being explored as a possible transitional fuel on the road to a non-petroleum-based future. Its chief advantage over other alternative fuel components is MTBE's octane-boosting experience giving a broader data base from which to predict the impact of greater ether levels in automotive fuels. There also may be a potential for synthesizing MTBE from coal in addition to its synthesis by combining a tertiary olefin (e.g. isobutylene, which is obtained as a second-order by-product of ethylene production or refinery cracking) and a primary alcohol (e.g. methanol, most likely from natural gas source). This synthesis from coal involves processes already identified, although questions of economics, regulation, and optimal use of facilities have yet to be fully addressed. Researchers at Sontech, Inc. have begun a Dept. of Energy (DOE)-sponsored study of etherified fuels to generate cost and use data so that ether compounds can be compared to other coal-based transportation-fuel options. Coal-derived ether fuel lies midway between highly-oxygenated methanol and conventional hydrocarbons (HC) in compatibility with existing fuel delivery systems. Although oxygenated, MTBE's oxygen content is relatively low compared to methanol's. This implies that MTBE's physical and chemical properties are somewhat closer to those of HC. Ether fuels might offer a means of transition when future petroleum-derived fuels may have to be supplanted by those obtained from alternative sources. In any event, economics will probably dictate the

route taken, and there is no reason to believe that only one route will prevail.

Publ: Automotive Engineering v86 n8 p64-7 (Aug 1978)

1978; Iref

Based on "Etherified Fuels—A Transitional Approach to Straight Oxygenated Hydrocarbons?" by A. Talbot, which was prepared for Dept. of Energy and presented at Hwy. Vehicle Systems Contractors' Coordination Meeting, Troy, Mich., 9-12 May 1978.

Availability: See publication

HS-023 918

HEADLIGHT IMPROVEMENTS. BRIGHTEN THE CORNERS (AND THE STRAIGHTAWAYS) WHERE YOU ARE

Brighter automotive headlights are being proposed by the National Hwy. Traffic Safety Administration (NHTSA) in Federal Motor Vehicle Safety Standard (FMVSS) No. 108, Lamps, Reflective Devices, and Related Equipment, which would legitimize headlight systems with total intensity of 150,000 candlepower. This upper limit is twice the intensity of most current systems on high beam. The proposed amendment holds fast to the sealed-beam concept as opposed to the bulb-type headlight units. The Lincoln Versailles is the first domestic model fitted with sealed-beam halogens as standard equipment. Although the lights are not extremely bright, they offer a 30% efficiency gain over tungsten burning in a conventional nitrogen/argon (N/Ar) atmosphere. These new lights are a cross between conventional U.S. lamps and bulb-type quartz halogens. The tungsten filament is encased in a high-purity (though not quartz) glass enclosure, which in turn is molded into the sealed-beam unit. The tungsten envelope is filled with a halogen gas; the outer lens enclosure with the usual N/Ar. By 1981, much of the new car fleet will be using halogens as part of more efficient electrical systems. This volume will translate into competitive prices in the halogen aftermarket, where higher lights are likely to be the rule, rather than the exception. European developments in halogen lights include seals to prevent contamination, epoxy clear-coats for protecting reflectors, and asymmetric photometric patterns, allowing more prominent lighting of road shoulders.

by Dennis Simanitis
Publ: Road and Track v30 n1 p28-9 (Sep 1978)
1978
Availability: See publication

HS-023 919

REVOLUTION IN CERAMIC DESIGN (DIESEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS)

Special considerations in the design of load-bearing ceramic parts are discussed. Since ceramics are brittle and apt to fracture unexpectedly, they have not been used extensively as load-bearing engineering materials. Stronger "superceramics" and deeper insight into brittle-material design are paving the way for new applications from diesel-engine pistons to spacecraft skins. The design of ceramic parts is discussed in terms of stress analysis; properties of such engineering ceramic types as ceramic oxide (oxides of alumina, beryllia, and zirconium), glass ceramics (lithium-aluminum-silicate, magnesium-aluminum-silicate, and aluminum-silicate), and carbide/nitride

developed by Ford Motor Co., and a modified diesel engine with a ceramic combustion chamber, piston, valve head, and exhaust ports which is being developed by Cummins Engine Co., are described and illustrated. Also described is a unique ceramic, "Macer", developed by Corning Glass Works, which is easily machined without cracking, and can be used for high-temperature parts because of its high thermal shock resistance and dimensional stability.

by John K. Krouse
Publ: Machine Design v30 n18 p94-9 (10 Aug 1978)
1978, 16cfs
Availability: See publication

IS-023 920

THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES

The interaction term of the Prigogine kinetic equation of vehicular traffic flow is modified in order to account for the existence of a nonnegligible number of queuing vehicles. In the Prigogine theory, the derivation of this term neglects the correlations between cars. Since cars traveling in a queue are strongly correlated, the existence of queues in the traffic flow must be taken into account by the model. In this study of a traffic stream consisting of a mixture of small queues, a new interaction term is derived from a model which considers the influence of many-car queues on the interaction frequency. Since the new term introduces the distribution function of the size of the queues, a second equation which gives the balance of relaxation and interaction processes is written for its function in the case of a stationary homogeneous flow. A check of the new theory against some experimental data previously used by other authors for a comparison with the Prigogine theory shows a noticeable improvement.

by Maria Lampis
Publ: Transportation Science v12 n1 p16-28 (Feb 1978)
1978, 16cfs
Presented at 10th Congresso dell'Unione Matematica Italiana, Cagliari, Italy, Sep 1975. Research sponsored by Consiglio Nazionale delle Ricerche (Italy).
Availability: See publication

IS-023 921

AN ATTEMPT TO CHARACTERIZE TRAFFIC IN METROPOLITAN AREAS

The differences and the similarities in traffic characteristics were explored among various U.S. metropolitan areas (Chicago, Detroit, Los Angeles, New York City/Newark, Phoenix, St. Louis, San Francisco, Salt Lake City, and Washington, D.C.) using a large observational data base collected by the General Motors Proving Grounds in its Chase Car study to determine and typify the automobile driving patterns of vehicles used by the public. The results show that speed distribution functions, including the percent of time stopped and average speed, are useful attributes for characterizing traffic on various roadways (CBD (central business district), urban, highway). In terms of the average speed and the percent of time stopped, the character of the traffic in several

of other major variables. The metropolitan noise and the coefficient of variation of speed are rather strongly correlated with average speed; the stop time is linearly related to trip time, the reciprocal of average speed. Therefore, among all the variables studied, average speed is particularly useful in measuring the "quality" of traffic in different areas on various roadway types. The analysis of the data from four areas shows that there is a significantly higher speed and correspondingly lower percent of time stopped in Los Angeles than New York City/Newark, with the results for Detroit and Chicago lying in between. Based on information on average speeds, the extent to which "traffic quality" might affect fuel consumption in different metropolitan areas has been estimated. For example, a vehicle requires 45% more fuel in order to travel the same distance in New York City/Newark CBD traffic and 12% more fuel in urban traffic than in Los Angeles under similar circumstances. Therefore, improving the urban traffic system by increasing its average speed offers considerable fuel economy benefits.

by Man-Feng Chang; Robert Herman
Publ: Transportation Science v12 n1 p58-79 (Feb 1978)
1978, 16cfs
Availability: See publication

IS-023 922

A SCHEME FOR EVALUATING A LOCAL QUEUE WARNING SYSTEM [ANALYSIS OF TRAFFIC CONTROL SYSTEM]

A method is outlined for evaluating a "local queue warning system", a system intended only, in principle, to warn drivers of unexpected congestion at known discontinuities of the road geometry (bottlenecks) and to give them advisory speed indications. Determining the effect of warning systems on road safety is of particular importance in enabling the installation of expensive warning systems to be weighed against the taking of alternative measures. The local queue warning system was selected for evaluation because a scheme for evaluating this type of system may also be used, with slight modifications, in the evaluation of other types of warning systems. The method is designed to determine the effect of the system in operation, ignoring any effects deriving solely from the presence of the system. The primary objective of the evaluation is to examine the extent to which the queue warning system increases road safety. A reliable appraisal of the effect of the system demands investigation of traffic behavior since this behavior forms the link between the measure and its effect upon safety. Failure to investigate traffic behavior in the past has frequently led to non-interpretable results or even to invalid conclusions. An important by-product of investigating behavior is the extension of knowledge about the traffic process. Since it is conceivable that the installation of a queue warning system will affect the throughput of traffic, this aspect is also considered. Traffic behavior measurement includes average speed, speed distribution, individual speeds, time intervals, and speed differences between two successive vehicles, and comparability of conditions (season, day, time, weather, traffic flow). Study of the effect of a queue warning system on traffic throughput includes queue size, journey times, input-output (entrance and exit traffic flow), and local speeds. Data needed for implementing the evaluation scheme include detailed road characteristics; construction work in the area;

other traffic influences (bridge openings, traffic signals); hourly traffic flow, traffic composition, and level of service; accident statistics; details of the recording system; and extent of police supervision and queue warning.

by H. Botma; H. L. Oei

Publ: Traffic Engineering and Control v19 n7 p350-4 (Jul 1978)

1978; 8refs

Availability: See publication

HS-023 923

REVOLUTION IN CAR WIRING

Packard Electric, the world's largest producer of electrical fixtures for cars, believes that the auto manufacturers' increasing movement into electronics will take its product from parts one of the simplest systems in the vehicle five years ago to use of the most sophisticated in the next 10 to 15 years. Among the features in future cars now challenging Packard's engineers are sophisticated multiplex wiring systems, inflatable air bags, closed loop and other advanced emission systems, diesel engines, various trip computers, engine diagnostic systems, and microprocessors or minicomputers for several functions. A new level of complexity will be encountered because with electronic components, much lower levels of electricity will need to be transmitted, a tenth of a volt vs. the basic 12 volts or more in the car normally. These low voltages will require different hardware. Multiplex wiring is considered to be a promising technology for the future, after some technical and cost problems are solved. With multiplex, a great many electrical or optical signals are sent at very high speed to electrical accessories throughout the car on a single wire by a minicomputer. Among the possibilities is the use of fiber optic "light fibers", perhaps combined with some sort of laser beam. Among recent changes is the adoption of new spark plug wiring combined with resistor plugs to reduce radio interference inside and outside the car. Packard Electric has developed a multi-function tone generator to provide up to eight audible or visual warnings (ignition key in, door ajar, seat belt, headlights on, low fuel, engine overheating, low coolant, or high/low voltage).

by Joseph M. Callahan

Publ: Automotive Industries v158 n11 p47-9 (Aug 1978)

1978

Availability: See publication

HS-023 924

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS [ENVIRONMENTAL PROTECTION AGENCY]

The Environmental Protection Agency's (EPA) reasons for concern over diesel exhaust products, some results of its research efforts over the last nine months concerning diesel emissions, and planned future health experiments concerning these substances are outlined. Diesel-powered vehicles emit about 30 to 50 times more particulates than comparable gasoline-powered cars equipped with catalytic converters, and particulates emitted from diesel vehicles are principally carbonaceous material with higher molecular weight organics adsorbed onto their surfaces. A significant portion, possibly of

stantial increase in the numbers of diesel cars in the U.S. One study involved testing the total as well as fractions of organic extract of diesel particulates from medium- and heavy-duty engines in an Ames Microbial Mutagenicity Bioassay Test System. Positive results were consistently obtained for the total organic extract as well as most of the fractions, and the aromatic content of the diesel fuel seems to have a direct relation to these responses. Additional *in vitro* screening tests using systems other than the Ames have shown the following: positive results in the enhanced mitotic recombination test for DNA damage using yeast cells and in the mammalian cell-gene mutation test using mouse lymphoma cells; a possible negative result in the unscheduled DNA syntheses using WI-38 cells derived from human lung cells; and no results yet on the point mutation using *Drosophila* (sex-linked, recessive lethal) and on oncogenic transformations using BALB/3T3, a mouse fibroblast cell system. Microbial mutagenic activity is concentrated in the polar subfractions of the neutral organic compounds, and there are indications that mutagens are not created as a result of extraction, fractionation, or storage nor are they present in uncombusted diesel fuel or fractions thereof. Preliminary results from a 50-day pilot study exposing cats, rats, mice, and guinea pigs to diluted raw exhaust from a light-duty, 6-cylinder diesel engine indicate no significant acute effects other than increased susceptibility to infection in the animals studied (which may be totally due to nitrogen dioxide) and alterations in the neurobehavioral activity of the rats tested which may be related to sensory perceptions of the exposure conditions. The health effects data here on diesels is quite limited; EPA presently speculates that the major biological endpoints to be investigated are chronic lung disease and carcinogenicity. The EPA plans to continue evaluating *in vitro* the particulate and gaseous components of the exhaust to identify fuel or engine parameters which can be altered to reduce or eliminate positive responses in the Ames system. The whole animal studies will consist of intratracheal instillation and skin painting and perhaps either beowax implantation, tracheal transection, or subcutaneous injection and exposure of several species of animals to inhalation of the whole exhaust. For noncarcinogenicity endpoints, neurobehavioral changes already observed will be further studied, to identify possible emphysema-like disorders.

by Delbert S. Barth; Stanley M. Blacker

Publ: Journal of the Air Pollution Control Association v28 n8 p769-71 (Aug 1978)

1978; 2refs

Availability: See publication

HS-023 925

FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS

A summary is presented of a 1977 pilot study conducted by the Hwy. Safety Res. Inst. (HSRI) to obtain information on the financial consequences of serious, critical, and fatal injuries (OAS (Overall Abbreviated Injury Scale) 4-6) sustained by persons involved in motor vehicle accidents, and to assess the effectiveness of personal interviews as a means of collecting the information. Of a sample of 120 cases randomly drawn from a population of 241 Washnaw County (Mich.) cases who had sustained such injuries during the period Dec 1967 through Dec 1974, 25 cases full involving OAS 4 or 5 (AIR 1

cases, the average financial loss was \$57,953. The average loss recovery per case was \$43,317, or 75% of the average overall loss per case. The cost findings of this and a previous study (in 1974, involving OJIS 1-3 injuries) are not definitive, but they do provide some insight into the increase in costs at higher levels of injury severity. The study results indicate that a personal interview is a reliable method of collecting data on cases involving serious and critical injuries, but it is not a feasible method of obtaining information from relatives of fatally-injured accident victims. It is recommended that occasional contact be maintained with accident-involved persons for several years, since medical and legal expenses may not be settled until three or four years after the accident.

by Joseph C. Marsh, 4th.; Richard J. Kaplan; Susan M. Kornfield
 Publ: HSRI Research Bulletin v9 n1 pt-4 (Jul-Aug 1978)
 1978; 1ref
 Based on UM-HSRI-77-27 "Financial Consequences of Serious Injury" (NTIS, PB-79-146) sponsored by Motor Vehicle Manufacturers Assoc.
 Availability: See publication

HS-023 926

FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS

A study was made of all 94 cases in the Hwy. Safety Res. Inst. (HSRI) Collision Performance and Injury Report (CPIR) file in which a seat-belted occupant received fatal injuries. Of the 94 occupants, 79 were wearing a lap belt and 15 were wearing a lap-shoulder belt. A major purpose of the study was to examine the role of intrusion in fatal injuries to properly-restrained occupants. The hard-copy report of each case was read in review the specific fatal injuries and their sources, and to judge whether the passenger compartment was compromised by collapse or intrusion of a foreign object. Findings show that 50% of the fatal injuries were to the head/face/brain region, and 49% involved compromise of the passenger compartment. Of ten persons killed in relatively nonsevere crashes (COC (Collision Deformation Classification) of 3 or less), eight incurred fatal head injuries. Particularly in the low COC extent cases, but also in many of the others, some more adequate protection of the head would have increased the chance of survival of these occupants. A type of head protection is not defined specifically, but one or more of several approaches are suggested. Roof rails and A-pillars, as the most frequent internal sources of head injury, may deserve more padding, although the amount of padding required might be so great that forward visibility would be impaired. Full restraints, if properly worn, should help, but many of the head contacts cannot be protected against by padding the object, particularly those contacts with outside objects such as buildings, railroad engines, trees, poles, or the exterior parts of other vehicles. An alternative approach would be to protect the head itself with an appropriate helmet. It is suggested that some further analysis of the protective ability of various kinds of helmets be studied, and that voluntary wearing of some sort of protective headgear would be in order.

by James O'Day; Richard Kaplan
 Publ: HSRI Research Bulletin v9 n1 pt-10 (Jul-Aug 1978)
 1978; 1ref
 Based on a study supported by Motor Vehicle Manufacturers

HS-023 927

INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES

An analysis of the Hwy. Safety Res. Inst. (HSRI) Collision Performance and Injury Report (CPIR) file of automotive accident reports isolated 522 frontal crashes in which the involved car(s) contained occupants in both the front and rear seats. These cases were analyzed to compare the frequency and severity of injuries incurred by front-seat and rear-seat occupants. The variables studied were crash impact speed, car size, seating location, age of occupant, and use or non-use of seat belts. The results indicate that rear-seat occupants were less frequently injured, at all levels of severity, than were front-seat occupants. Occupants injured more than moderately (i.e. AIS (Abbreviated Injury Scale) 3-6) rank as follows (in terms of percentage of such occupants): front-seat, non-belted, 17.3%; front-seat belted, 14.3%; rear-seat non-belted, 10.5%; and rear-seat belted, 11.3%. In cases when impact speed was greater than 26 mph, 3.7% of all rear-seat occupants were killed, compared to 9.1% of all front-seat occupants, and 6% of all non-belted front-seat occupants were killed, compared to 3.2% of all belted front-seat occupants. The findings suggest that in this population of fairly severe frontal crashes studied, seat-belt wearing by front-seat occupants afforded them about the same protection they would have experienced if they had been occupying a rear seat, belted or non-belted.

by Donald F. Hinkel; Thomas E. Lawson
 Publ: HSRI Research Bulletin v9 n1 pt-1-3 (Jul-Aug 1978)
 1978; 14refs
 Availability: See publication

HS-023 928

THE AUTOMOBILE INDUSTRY

An overview is offered of the important aspects of the American automobile industry, its strengths and weaknesses, efficiencies and deficiencies, and commissions and omissions. Background information is provided with a review of the important historical landmarks of this industry from its early experimental days to the present. A discussion of the important structural characteristics of the industry and of the product follows, including size distribution of automobile firms and barriers to entry (economies of scale, capital requirements, and legal restrictions). The behavior of the industry is examined, with an attempt to relate it to the structural characteristics previously discussed. An assessment of the performance of the automobile industry is then given. Public policy as it has related to the American automobile industry is reviewed, including prices and the franchise system, air pollution and safety, and antitrust laws, and a discussion of possible improvements in policy is presented. A list of suggested readings is included.

by Lawrence J. White
 Publ: "The Structure of American Industry, 5th ed.," Walter Adams, ed., New York, 1977 Chap. 5, p163-220
 1977; 2ufs
 Availability: See publication

HS-023 929

DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT

The Driver Aid and Education Test Project was initiated by the Dept. of Energy (DOE) in order to test the hypotheses that measurable improvements in fleet fuel economy can be achieved by driver awareness training in fuel-efficient driving techniques and by a manifold vacuum gauge, used individually or in combination with each other. The project, conducted from Apr 1976 through Dec 1977, in the Las Vegas, Nev. area, collected data from 435 light-duty fleet vehicles driven in typical highway and urban environments. More than six million test vehicle-miles were accumulated in the course of the project. The Motor Minder dial-type and the Vacuach piston-type manifold vacuum gauges were utilized. The test results support the hypothesis stated above, but the improvements (4% to 6%) were less than had been achieved in earlier tests conducted by others (10% to 20%). This difference may be attributable to the fact that motivational and performance feedback techniques were deliberately omitted from the test environment. Smaller improvements in fuel economy also appeared in the untreated control groups, suggesting that driver knowledge of the test and informal information exchange among drivers about fuel-efficient driving techniques may have influenced the results. The following general recommendations are offered, based upon the results of this test project: an immediate installation of vacuum gauges on additional government vehicles; continued support for research by DOE in the area of fuel-efficient driving techniques; further analysis of data collected, specifically in the areas of statistical methods, driver characteristics, vehicle characteristics, the Hawthorne effect (influence of knowing that a test is being conducted on the participants' responses), correlation of fuel economy with driver characteristics and job assignments, etc.; consideration by the Federal government of requiring that all applicants for Federal driver's licenses complete training in driver energy conservation awareness prior to licensure; preparation of a teaching textbook for vehicle fleet operators; and initiation of further research in human factors in order to develop more effective methods of providing audio/visual/tactile feedback to the vehicle driver, facilitating fuel-efficient driving behavior.

Department of Energy, Nevada Operations Office, Las Vegas, Nev.

Rept. No. DOE/CS-004; UC-96; 1978; 140p 14refs

Rept. for Apr 1976-Dec 1977.

Availability: NTIS \$7.25 printed copy, \$3.00 microfiche

HS-023 930

MEASURING THE LATERAL POSITION OF VEHICLES ON THE ROAD: SYSTEM AND PRELIMINARY RESULTS

A simple, fully-automated, portable system for measuring the lateral position of a number of passing vehicles in particular locations of a road network, undetectable by drivers and at a low operating cost, has been developed and initially applied. Four photocells are set over the road, two parallel and the other two at a known angle to the others so that the beams are cut off by the tires of the vehicles. The velocity of a vehicle is calculated from the time which a vehicle spends between the two parallel beams, and the lateral position from the other two time intervals between offsets of photocells according to three formulae. This arrangement presupposes constant-velocity

from the direction of the road can be calculated if an additional photocell is used. In this case, directional angle with the main direction of the road, velocity, and distance from the reference point (intersection of the oblique-angled beams) can be calculated from three other formulae. In the present configuration, the equipment consists of four infrared photocells and four reflectors on opposite sides of the road. The heart of the system is composed of an 88-microprocessor and 2K random-access memory with control program loaded from C-cassette. This microcomputer is used to measure time intervals between offsets of beams and to calculate speed and lateral distance from the reference point for each passing vehicle. The device also measures the time interval to the head vehicle (headway) and to the last oncoming vehicle, and stores all this information (plus that given from the keyboard) on digital cassette recorders and displays the values of the desired variables. All this is carried out for vehicles traveling in both directions. In spite of some minor deficiencies (e.g. inability to record position information for every vehicle under two-way traffic conditions), it is felt that the equipment will be very useful when data on the lateral position of vehicles are needed and, after some improvements, its production will be started in the near future.

by H. Summala; A. Merisalo

Publ. Traffic Engineering and Control v19 n7 p328-30 (Jul 1978)

1978; 14refs

Availability: See publication

HS-023 932

STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD

An analysis by the finite-element method and a related computer program is presented for an axisymmetric solid under asymmetric loads. (Failures such as belt edge and chaffer strip edge separations are considered to have a close relation with internal stresses and strains in tires, but there are few theoretical studies on the determination of these stresses and strains under asymmetric loading conditions such as vertical load.) Calculations are carried out on displacements and internal stresses and strains of a radial tire loaded on a road wheel of 600-mm diameter, a road wheel of 707-mm diameter, and a flat plate. Agreement between calculated and experimental displacements and cord forces is quite satisfactory. The principal shear strain concentrates at the belt edge, and the strain energy increases with decreasing drum diameter. The temperature measurements show that the strain energy in the tire is closely related to the internal temperature rise.

by H. Kaga; K. Okamoto; Y. Tazawa

Publ. Tire Science and Technology v5 n2 p102-18 (May 1977)

1977; 8refs

Availability: See publication

HS-023 933

60 MPG BY 1985 (MILES PER GALLON, UNITED KINGDOM)

A forecast is made of reductions in fuel consumption by automobiles in the year 1985 as a result of improvements in automobile design and maintenance. The following reduction percentages in fuel consumption are predicted for improvements other than those related to combustion and engine design:

weight and drag reductions, and improvements in tires and accessories, 10%; transmission design, 5% to 10%; and improvements in vehicle maintenance (i.e. elimination of most of the maintenance that affects engine performance as a result of such new designs as electronic ignition systems), 5%. Three engine and combustion improvements will result in increased miles per gallon (mpg): use of very much higher compression ratios; much better combustion at part-load operation, when cruising, or driving along slowly in traffic; and computerized ignition systems. It is stated that an increase of 50% in mpg figures with eight years can be expected with approximately a 25% to 30% increase coming from engine modifications, and the remainder from external changes. As examples of this mpg improvement in terms of British cars, a 45 mpg Cortina or Marina, and a 60 mpg Mini should be available by 1985.

by John Hartley
 Publ: Autocar v147 n4230 p25-7 (3 Dec 1977)
 1977
 Availability: See publication

HS-023 915

GENERATING HYPOTHESES TO EXPLAIN ACCIDENTS AND OTHER RARE EVENTS

A method for generating hypotheses in safety research to explain accidents and other rare events is presented, based on the premise that the functioning of the universe and its constituent parts reflects a continuum of interacting event (an actor plus an action) sets. Each event influences one or more events that follow that event in time. The precede/follow logic of the related event sets and the simultaneous visual display thereof provides the key to this method. The accident investigation process is based on an analytic or "events breakdown" principle. This breakdown process, one that involves more and more detailed specification of series of related events, can be continued for as long as necessary to gain the necessary understanding of the phenomenon. Each time an event is subdivided, the need for more precise understanding of the actor-action relationship arises, and the last known action by an actor provides a starting point to hypothesize the next action(s) that must have been taken by the actor in order to arrive at the next known action supported by the evidence. This method of breaking down the events sequence structures the discovery of unknown events required for the sequence to proceed from beginning to end. Thus, hypotheses are generated to explain the mechanism of the total process. Principles for displaying the event sequences, which further facilitate discussion and discovery, have been proposed where the event sequences involve two or more actors (Ittenner, 1975). Referred to as a "multilinear events sequencing method", it provides opportunity for a precede/follow logic check along both the horizontal time coordinate for a single actor, and along vertical coordinates for the sequencing of related events by two or more actors. This chronological and visual validation provides a method for "proving" a hypothesis that differs from the traditional statistical or experimental approaches of the scientific method. This methodology can be useful for predictive study of rare events or accidents. If one can accept that accidents are multi-event phenomena involving more than one actor, whose actions must occur in specified chronological sequence as conditions, a breakdown of other phenomena

event sets in the necessary relationship that is rare, rather than the occurrence of individual events within the set.

by Ludwig Benner, Jr.
 National Transportation Safety Board, Hazardous Materials Div., Washington, D.C.
 Publ: Journal of Safety Research v10 n1 p3-4 (Spring 1978)
 1978; 4refa
 Availability: See publication

HS-023 936

A NOTE ON TIRE ROLLING RESISTANCE DUE TO TEST WHEEL CURVATURE

An approach based on semi-empirical assumptions which include such parameters as inflation pressure, carcass stiffness, tread radius, and internal tire structure and shape, makes it possible to calculate flat-surface rolling resistance of tires from data taken on a laboratory test drum. Tire rolling resistance is affected by laboratory drum diameter; such tests produce higher rolling resistance values than road testing. The parameters mentioned above are too complex to be included in a general manner in laboratory wheel vs. road testing. A comparison of calculated and experimental results for a 7.00-16 passenger tire is presented. The critical value below which the accuracy of the prediction formula may not be acceptable appears to lie in the vicinity of a ratio of drum to tire diameter equaling 1.75. It is suggested that the method requires further refinements which would enable large tires to be tested on relatively small test wheels, thus avoiding more costly highway tests.

by M. G. Bekker; B. V. Semonin
 Publ: Tire Science and Technology v5 n12 p19-22 (May 1977)
 1977; 1ref
 Presented at Symposium on Indoor Tire Testing, Akron, Ohio, 12 Nov 1975.
 Availability: See publication

FIS-023 937

SHOPPING FOR TYRES? [TIRES]

Information is presented as an aid to the prospective buyer of automobile tires. Some questions pertinent to a buyer's decision-making and subsequent usage of purchased tires are answered. The topics treated include the following: availability of cross-ply tires, steel- vs. fabric-belted radials, low-profile tires, run-flat tires, fitting tubes in tubeless tires, front vs. back placement of pairs of new tires, rotation of tires, tire pressures, legal requirements for condition of tires, mixture of tire types, and recommended sustained maximum speeds for tires. A buyer's guide is presented (applicable to the U.K.), with information on what tires are available, what sort they are, and in what sizes. Approximate lowest prices are given for the smallest and largest sizes in each type.

by Michael Scarlett; Martin Lewis
 Publ: Autocar v148 n4251 p38-46 (29 Apr 1978)
 1978
 Availability: See publication

It is stressed that the value of aerodynamics in the design of automobiles, with particular reference to the U.K., is still not widely appreciated, since automobile designers or stylists are presently only industrial designers and do not know about aerodynamics. It is stated that of all the resistances to motion, aerodynamic drag is the most important single item. A table is presented which shows a simple method of calculation of performance figures for a typical modern car, and graphs provide data on engine net power, drive line efficiency, and tire rolling resistance for the typical modern car. The graph for rolling resistance had to be compounded from general information gleaned from many manufacturers, since very little information is available on the subject. The reason for inadequate data is that testing of tires seems to be limited to trials against a revolving drum, which is completely useless as far as vehicle performance estimation and prediction are concerned. The motor industry's state of vast ignorance may well be the reason for the lack of appreciation of the relative importance of rolling and aerodynamic resistances, especially at the lower speeds. At present, it is felt that aerodynamics has probably more to offer in terms of direct fuel saving than any other discipline. Test bed information is needed initially, especially about part throttle specific fuel consumption. Curves are needed in which power output, engine speed, butterfly angle, and specific fuel consumption are shown as a carpet (illustration provided). With such information, coupled with some accurate tire drag figures, a new breed of vehicle would be forthcoming which would be considerably different in appearance from those currently available and would be of greatest national importance in terms of fuel economy. The author was responsible for the aerodynamic design of the first Lotus Elise and the Lotus Mk XI, which demonstrate superior fuel consumption curves over other models.

by Frank Covin

Publ: Automotive Engineer v1 n1 p29-32 (Oct 1975)

1975

Availability: See publication

HS-023 939

TECHNICAL ASSESSMENT OF FMVSS 121, AIR BRAKE SYSTEMS

The background for Federal Motor Vehicle Safety Standard (FMVSS) 121, Air Brake Systems, is described, including the Standard's basis, evolution, and the circumstances surrounding the present controversy which led to the establishment of the 121 fact-finding task force. Safety implications of FMVSS 121 are discussed, including a summary of the heavy-duty truck accident problem, a statistical evaluation of the effects of FMVSS 121, qualitative studies and surveys, and reports of accidents allegedly caused by 121 brakes. The reliability and maintainability of antilock brake systems are discussed, as well as of other 121 components. The effectiveness of the National Hwy. Traffic Safety Administration defect investigation and the magnitude of the defect problem are discussed, as is the compatibility of FMVSS 121-equipped and pre-FMVSS 121-equipped vehicles when operated in combination. Among the items included in attachments are the following reports: "Preliminary Findings on the Fleet Accident Evaluation of Federal Safety Standard 121," by Kenneth L. Campbell, in HSRI Res. Review (Sep-Oct 1977); "Maintenance Comparison on FMVSS No. 121 Configured Vehicles Versus Non-121 Con-

Summary of Accident Investigations 1973-1976," by the Federal Bureau of Motor Carrier Safety, and a CHP study of 121-equipped vehicles; Testimony (7 Dec 1977) of Donald K. Strout of Wilson Freight Co.; "A Report on Field Experience on Motor Freight Equipment Built to Meet the Braking Requirements of FMVSS 121"; "A Case Study Report on 14 Fleets - FMVSS 121"; "American Trucking Association's FMVSS 121 Users Survey" (Oct 1977); "Case Histories Gleaned from Files of Private Truck Council of America and Its Resolution on MVSS 121"; "FMVSS 121 Pilot Vehicle Inspection and Driver Interview Program"; "Analysis of Reliability Data from Vehicle Manufacturers and Suppliers"; and NHTSA's Fleet Visits Survey and computer summary of motor vehicle safety defect recall campaigns, 9 Sep 1966-31 Oct 1977 (antilock only).

National Hwy. Traffic Safety Administration, Washington, D.C. 20590

1976; 410p

Availability: Reference copy only

HS-023 940

MOTOR GASOLINES, WINTER 1977-78

Analytical data for 2,738 samples of motor gasoline from service stations throughout the U.S. were collected and analyzed. The samples represent the products of 52 companies, large and small, which manufacture and supply gasoline. These data are tabulated by groups according to brands (unlabeled) and grades for 17 marketing districts into which the country is divided. A map shows geographical areas, marketing districts, and sampling locations, and charts indicate the trends of selected properties (octane numbers, Reid vapor pressure, and distillation temperature) of motor fuels since 1946. Twelve octane distribution charts for the four geographical areas (Eastern and Gulf Coast states, Central states, Mountain states, and Western states) for unleaded, regular, and premium grades of gasoline, are also presented. The antiknock (octane) index [(R plus M)/2] averages of gasoline sold in the country were 88.6, 89.5, and 94.9 for unleaded, regular, and premium grades of gasoline, respectively.

by Ello Mae Shelton

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Rept. No. BE/CT/PPS-78/3; 1978; 82p 4refs

Prepared in cooperation with the American Petroleum Inst.

Availability: NTIS \$6.00 paper copy, \$3.00 microfiche

HS-023 941

QUADRIPLÉGIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS

Improperly managed forces in motor vehicle crashes are the leading causes of quadriplegia and paraplegia (spinal cord damage) and of epilepsy (due to brain scarring). These forces are a leading cause of facial non-cosmetic plastic surgery, and the leading cause of death for American teenagers. There is much evidence that long-practical improvements in motor vehicles would reduce fatalities and injuries, even in very severe crashes, and that some vehicle manufacturers have fought to delay these improvements. For example, General

Motor's (GM) dealers discouraged purchase of air bags, and find underestimated the success of its transient promotion of seat belts. Among these improvements are automatic crash protection systems (air bags), crash-testing of new vehicles, and more durable gasoline tanks. The history of legal decisions indicates that reasonable safety is implicit in proper vehicle design. A reanalysis of the data upon which GM reported unfavorably indicates that when crashes of all directions and types combined were analyzed, the frequency of serious injury was about 40% less for occupants of air bag-equipped cars, the same as the 40% fatality reduction estimated by DOT. It is recommended that motor vehicle manufacturers commit more constructively on government proposals to reduce injuries; that they propose needed Federal Motor Vehicle Safety Standards (either new or upgraded); that they show leadership in developing research safety vehicles; and that they exceed minimum standards.

by William Haddon, Jr.
Insurance Inst. for Hwy. Safety, Watergate 600, Washington,
D.C. 20037
1978; 25p 66cfs
Presented at Automotive News World Congress, Detroit, 25
Jul 1978.
Availability: Corporate author

HS-023 942

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING

A description and analysis are presented of a series of unopposed automobile headlighting experiments emphasizing the phenomena involved in the detection of dark obstacle targets simulating the hazardous objects encountered during night driving. In the detection experiment, the visibility levels were established for the observer-driver by retracting the visual targets at predetermined distances from the test vehicle. The luminance difference signal at or near the threshold of detection defined the visual task. Laboratory work measured observer visual potential in luminance difference discrimination in order to supplement the field studies. The treatment or inclusion of the following psychophysical elements or combinations of these is considered to be unique: measurement of individual visual potential at low light levels to account for participant task sensitivity; elimination of distracting human factors such as fatigue, lack of awareness, and response and eye movement limitations; an unencumbering visual task; and field detection at or near the 50% probability threshold. The influences of atmospheric luminance, dynamic vehicle pitch, target shadow enhancement, foreground luminance, and fixation duration were included in the analysis of the field detection trials. Several different measures of target visibility were employed. It was shown that a contrived value of target luminance difference can be used as an index of the detection of dark hazard-like objects of concern in night driving. One-to-one correspondence established between laboratory measurements of visual potential and roadway detection trials shows that a comprehensive treatment of the detection processes associated with night driving is possible.

by P. Huculak
National Res. Council Canada, National Aeronautical
Establishment, Ottawa, Ont. K1A 0S2, Canada
Rept. No. NAE-MS-141; NRC-16780; 1978; 44p 16cfs
Includes French title and summary.
Availability: Corporate author

HS-023 943

DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYELLIPSE PROJECT

Eye position data were collected for subjects in four vehicle types (1976 Vega station wagon, 1973 Buick Le Sabre, 1973 Chevrolet van and 1976 International Transport II) and in three environments (laboratory back, static vehicle and on-the-road vehicle). Subjects positioned their seats about .2 in further rearward in the actual vehicles than in the laboratory trucks. Drivers' mid-eye positions varied as a function of vehicle type. Subjects' eyes were about .8 in more rearward in the Vega than in the sedan, had less spread in the Y dimension and were about .3 in. lower. Subjects sat more toward the vehicle's center line (about 3 in) in the van than in the sedan, and their eyes had more spread in the Y dimension. When in the truck, the mid-eye position of 25 male experienced truck drivers had less spread in the Y-dimension, and were 2 in. higher in the Z dimension than those of the sedan subjects. There were also interactions between vehicle types and target locations. Drivers' mid-eye positions also varied as a function of the laboratory, static and road environments. For the X-dimension, subjects' mid-eye positions were further forward in the laboratory truck than in the static or road environments for the Vega, van and truck. For the Y-dimension, the mid-eye positions were more toward the center of the vehicle in the static condition than in the road condition for all vehicle types except the sedan. In the Z-dimension, subjects' eyes were higher in the laboratory condition than in the static or road conditions. Thus it appears that it may be possible to collect eye-position data for some targets using a static vehicle. However, data collected in laboratory backs appear to be highly biased due to difficulty in accurately building and measuring the backs and/or absence of upper vehicle structure. Future research should be directed at correlating data collected on-the-road in different vehicle types with package geometry. It appears that a factorial or fractional-factorial design should be used to systematically study the effects of package geometry on drivers' eye locations.

by Ronald R. Mowrer; Tong-Kun Phik; Elmi Mousa-Hamouda
Wayne State Univ., Dept. of Industrial Engineering and
Operations Res., Detroit, Mich. 48202
1978; 167p 7cfs
Sponsored by Motor Vehicle Manufacturers Assoc. of the
United States, Inc.
Availability: Corporate author

HS-023 944

A TECHNIQUE FOR MEASURING INTERIOR WIND- RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN

A technique has been developed to evaluate interior wind-rush noise in the windshield-pillar area during wind tunnel tests of full-size clay models of motor vehicles. A small, box-like enclosure with acoustic characteristics made similar to those of a typical vehicle interior is inserted into the clay model behind an actual front sideglass. The wind-rush noise coming through the sideglass is directly measured by microphones located within the enclosure. Using this technique at this early design stage, various features of the model can be studied and modifications easily made to minimize the wind-rush noise. Based on a comparison of noise measurements obtained on-

road with those in a wind tunnel, it is predicted that the wind-rush noise levels and spectra recorded in the tunnel will agree well with those measured on-road using a similar enclosure installed in the actual steel car when it becomes available. From a comparison of actual wind-rush noise measurements with subjective ratings of noise, a measured change in noise level of 1 dBA was found to represent a 1 point change in the subjective rating of the wind-rush noise. The work has shown that the wind-rush noise of a single sideglass, directly measured by microphones in the enclosure, can be used to predict the total vehicle interior wind-rush noise, assuming the door and window seals are good (no air leaks) and the interior size is within 20% of the compact-size test vehicle used in this work. Within this size range the total interior wind-rush noise can be expected to be in the order of 7 dB to 8 dB above that measured through a single sideglass. If this technique is used on models outside this size range, it is suggested that a test vehicle of similar size be used to establish the total noise level difference. Other applications of this technique can study wind-rush noise or other noise spots on the exterior surface of a prototype vehicle, such as door seal attenuation of wind-rush and traffic noise, wind-rush noise at the windshield-roof intersection, tire-roadway interaction noise transmission through the rear wheel well, and interior wind noise due to luggage racks, roof spoilers, etc.

by Lawrence J. Oswald; David A. Dolby
General Motors Corp.
Rept. No. SAE-770394; 1977; 12p 6refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 945

A NEW METHOD OF INVESTIGATION OF SWIRL PORTS

A new method is described for the determination of swirl in internal combustion engines, which is based on the direct measurement of the angular momentum of the cylinder charge. It is shown that the results obtained with this method are much more reliable than those obtained with the classical vane-type anemometer. A corresponding swirl parameter is defined and its relation to conventional swirl parameters is discussed. Engine tests prove this swirl parameter to be the flow characteristic which controls the combustion in direct-injection diesel engines. On the basis of these results, it is possible to use cylinder heads with flexible swirl production for the development of combustion systems, since it is possible to transfer the optimum swirl adjustment to the final cylinder heads. It is shown that the problem of the cylinder head with two swirl producing inlet ports can be easily explained, and that a positive influence of the two swirl flows on each other is possible. It is indicated that the angular momentum method adds a new dimension to inspection of series production of cylinder heads.

by Gatz Toppelmann
Rept. No. SAE-770404; 1977; 16p 23refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 946

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

Utilizing several types of inlet ports, the well-established steady-flow method for assessing the swirl potential of a cylinder head in a direct-injection diesel engine was evaluated. It is concluded that directional ports, in particular, would seem to produce a highly unsymmetrical flow pattern at the plane in which swirl measurements are usually made, and large variations in both tangential and axial velocity components were observed over the one bore cross section studied. Vane anemometer results, therefore, could not be expected to give readings which could be used to estimate accurately the angular momentum flux corresponding to a particular valve lift. Helical or snail ports gave a much more uniform flow pattern in the steady-flow tests and produced comparatively high swirl values at low valve lifts. Although the swirls at high lifts were lower than those produced with directional ports, it should be noted that the helical port has the advantage of high discharge coefficients, thus improving engine breathing capacity. Orifice restrictors inserted in the liners used for the steady-flow tests resulted in a much more uniform flow pattern with a closer approximation to solid-body rotation at the one bore position. The measured swirl increased dramatically when using restrictors, the observed swirl being about twice as large as that in the normal steady-flow test in the case of directional ports. The corresponding increase for the helical port was less marked since this type of port produces more uniform flow conditions in any case. From the limited results available, it would appear that the normal steady-flow test would predict a lower value of the swirl in the combustion chamber at top dead center than is measured by hot wire anemometry. While the introduction of a restrictor in the liner would seem to produce an overestimation of the swirl, the predicted values would be considerably reduced if wall friction effects were taken into account. The cylinder swirl rates measured in the present investigation would seem to be in general agreement with results obtained by other researchers.

by M. J. Tindal; T. J. Williams
University of London, King's Coll., Dept. of Mechanical Engineering, London, England
Rept. No. SAE-770405; 1977; 15p 10refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 947

STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER

Three-dimensional air motion in a motored diesel engine was studied using a hot wire anemometer. A three-probe orientation technique (Huebner and McDonald, 1969) was adapted to obtain the three components of the velocity at the point of measurement. The probes were calibrated in a high-pressure and high-temperature wind tunnel. The variables studied were engine speed, valve timing (size and orientation), and compression ratio. It was found that while during a larger part of

valve influence on the inlet passage had a considerable influence on the tangential velocity distribution in the cylinder. The extent of masking also altered considerably the velocity distribution; a mask angle of 60 degrees 90 degrees should be more than sufficient when it is used in a specially-designed inlet passage to yield optimum values tangential velocity. In the range of compression ratio variation, there was a marginal increase in the value of the tangential component of velocity. The cycle-to-cycle variation in the velocity values indicate the presence of large-scale turbulence in the engine cylinder. It is believed that further studies of nature of this turbulent motion, using the present experimental technique, are likely to yield valuable data for the study of fuel mixing and unsteady-state heat transfer analysis.

T. R. Jagadeesan; B. S. Murthy
Tamil Nadu Engineering Coll., India; Indian Inst. of Tech.,
Madras, India
Rept. No. SAE-770406; 1977; 14p 10refs
Presented at International Automotive Engineering Congress
& Exposition, Detroit, 28 Feb-4 Mar 1977. Sponsored in part
by Directorate of Technical Education, Government of Tamil
Nadu (India).
Availability: SAE

HS-023 948

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE

Heat transfer measurements were obtained of instantaneous heat transfer rates at positions on the piston and cylinder head surfaces of a high-swirl, direct-injection diesel engine using thin film thermocouples; and thermal radiation measurements were obtained at two points, which provided "views" of the central and edge regions of the combustion bowl. The surface thermocouple measurements revealed two distinct zones in the piston-cylinder combustion space, a high-temperature zone consisting of the piston bowl and the adjacent head surface, and a low-temperature zone comprising the annular squish region. The peak heat fluxes in the piston bowl zone were approximately double those in the squish zone. Previous measurements of the instantaneous air motion in the engine were used to compare the convective heat transfer in the two zones with acceptable accuracy, using available information on forced convective heat transfer to flat surfaces and gas temperatures representative of the two zones. The radiative heat flux measurements using a specially constructed pyroelectric detector support the zoning concept resulting from the thermocouple measurements, and also corroborate the findings of other researchers. The relative magnitude of radiative to convective heat transfer observed in this study was not as high as reported in other studies. This discrepancy is considered to be a consequence of the high-swirl engine used in the present investigation. A scheme proposed by Anand (1974) for computation of radiative heat flux from known soot concentration has been shown to produce results of the right order of magnitude, and to indicate trends.

J. C. Dent; S. J. Suliman
University of Technology, Dept. of Mechanical Engineering,
Loughborough, Leics., England
Rept. No. SAE-770407; 1977; 28p 24refs
Presented at International Automotive Engineering Congress
& Exposition, Detroit, 28 Feb-4 Mar 1977. Sponsored by
Science Res. Council (U.K.) and Government of Iraq.
Availability: SAE

HS-023 949

STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE

A causal relation is shown to exist between the cycle-to-cycle variability of the pressure-time (p-t) trace and the noise radiated from a single-cylinder, direct-injection diesel engine. Measurements conducted over a range of load and speed include spectral analysis of the p-t trace and the radiated noise, as well as coherence measurements between the cylinder pressure and noise signals. In the spectral analysis of the p-t trace, a signal-averaging technique is used to separate the periodic part of the trace from the random fluctuations superimposed on the periodic part. In the data reduction scheme, account is taken of the effect of imperfect speed and load control on the results. The results are supported by knowledge of the randomness of turbulent combustion in other flow systems. The following conclusions are only valid for the particular engine tested; much further work is needed on other engine types. Above a certain frequency, dependent upon load and speed, the diesel engine cylinder pressure spectrum is dominated by cycle-to-cycle variations in cylinder pressure, not by repeatable, periodic processes. Except at very low load, the noise radiated from the test engine is almost fully coherent with the cylinder pressure; above the critical frequency the noise bears a causal dependence upon the randomness in the cylinder pressure. For the engine tested, regardless of load and speed, somewhat greater than one-half of this noise output may be ascribed to randomness of combustion. The transverse wave motion of the cylinder gases is always driven by combustion processes which are random in space and time, not deterministic. The exact origin of the randomness in cylinder pressure, loosely described as due to the turbulence of combustion, is unknown and much more work is required to define the exact origin or combination of causes.

by Warren C. Strahle; John C. Handley
Georgia Inst. of Tech., School of Aerospace Engineering,
Atlanta, Ga.
NSP-AER75-0377
Rept. No. SAE-770408; 1977; 15p 4refs
Presented at International Automotive Engineering Congress
& Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 950

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE

The design and application are described of a high-speed, timed, sampling valve for the extraction of gas samples, at a variety of points and times, from the combustion chamber of a medium-speed diesel engine. The valve was traversed radially into the combustion chamber and combined with rotation of the central fuel injector to give sampling at 16 points relative to the fuel spray. For any given sample, the valve opened and closed at the same time each cycle. Samples were analyzed, and the levels of CO (carbon monoxide), CO₂ (carbon dioxide), and NO (nitric oxide) were recorded for the complete combustion process. The valve has proved to be easily controlled, to give reproducible results, and to enable samples to be taken and analyzed easily and rapidly. Waterside attack has

limited its life, but it is expected that this disadvantage will be overcome by the use of different materials for the valve body.

by N. D. Whitehouse; R. Clough; P. S. Roberts
University of Manchester, Inst. of Science and Technology,
Dept. of Mechanical Engineering, Manchester, Lancs.,
England
Rept. No. SAE-770409; 1977; 11p 8refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977. Research
sponsored by Science Res. Council (U.K.).
Availability: SAE

HS-023 951

CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL

A two-zone (homogeneous nonburning zone of air, and another homogeneous zone in which fuel is burned with entrained air) model used for diesel engine performance calculations has been expanded into four zones by dividing the air-fuel mixing (or burning zone) into three parts: a fuel zone, a stoichiometric burning zone, and a combustion products-plus-air zone (the fourth zone being the air zone, or unburnt zone). This gives a high-temperature zone for reaction kinetics calculations of NO (nitric oxide) and a colder quench zone. Equilibrium calculations are used for CO (carbon monoxide) and CO₂ (carbon dioxide) which involve combustion, heat transfer and thermodynamic calculations. The model was used to predict the effect of design and operating conditions on the formation of NO. A very reasonable comparison was found between these results and a limited amount of experimental evidence obtained by a time sampling valve.

by N. D. Whitehouse; N. Balaswamy
University of Manchester, Inst. of Science and Technology,
Dept. of Mechanical Engineering, Manchester, Lancs.,
England
Rept. No. SAE-770410; 1977; 12p 8refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977. Research
sponsored by Science Res. Council (U.K.).
Availability: SAE

HS-023 952

EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS

Results of a comprehensive series of steady-flow tests on piston-controlled inlet and exhaust ports are presented. These data are intended to be used in computer simulations of the flow characteristics of valves as part of the process of designing and developing internal combustion engines. A wider range of pressure ratios than in previous studies for normal and reverse flow directions is provided and comparative results, with and without the restrictions of an exhaust bell, are included. The concept of effective flow area is briefly discussed and relevant equations provided. Previous experimental work is reviewed. The general result of the steady-flow tests is that there is an almost linear relationship between effective flow area and port opening. The effective area increases with pressure ratio over the whole range of port

openings. The use of inlet guide vanes increases the effective flow area and the presence of an exhaust bell reduces it.

by W. A. Woods; A. Allison
University of Liverpool, Dept. of Mechanical Engineering,
Liverpool, Lancs., England; Imperial Chemical Industries Ltd.
(U.K.)
Rept. No. SAE-770411; 1977; 12p 11refs (ref. 9 incomplete)
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977. Research
sponsored by British Ship Res. Assoc.
Availability: SAE

HS-023 953

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL

Injection of water into water in a cylindrical tank, using an indicator dye for flow visualization, is used to represent the mixing of a fuel spray in swirling air in a diesel engine cylinder. Effects of changes in swirl and jet penetration parameters are shown. Limitations in experimental technique have resulted in some gross simplifications, and in neglect of fuel droplets and air velocities generated by piston movement (i.e. squish). This technique may be used to verify complex analytical models of combustion under simplified conditions. The use of relatively simple parameters for jet penetration and swirl derived by dimensional analysis enables the operating conditions of the rig to be related to actual engine parameters. The results show that near optimum mixing can be obtained on the rig using injector dimensions corresponding to those giving good performance on the engine, thereby indicating the validity of the method.

by Richard J. B. Way
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Somerset, England
Rept. No. SAE-770412; 1977; 11p 8refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 954

PREDICTION OF SPRAY EVAPORATION IN RECIPROCATING ENGINES

A theoretical model for predicting the evaporation process of liquid fuel sprays in both diesel and SI (spark ignition) stratified-charge engines is presented. The injected liquid fuel is assumed to break up into droplets with a certain time delay which is determined through careful experiments on the heat absorption process of injected fuel in a high-temperature, high-pressure inert atmosphere. The evaporation, heat absorption, and motion of these droplets are computed, together with the change of gas conditions inside the spray, by solving a coupled system of equations made up of heat and mass balance between droplets and gas. The effects on evaporation of such parameters as the surrounding gas conditions, fuel properties, and spray characteristics are investigated. The effects of fuel volatility and the surrounding gas temperature on evaporation are notable at low ambient gas temperatures. At very high ambient temperatures the rate of evaporation has approximately the same pattern as the injection rate, but retards about half a msec from the injection rate. The most important spray characteristics relative to evaporation are droplet size and

which decreases rapidly towards the thermodynamic equilibrium temperature. This temperature decrease is of the order of several hundred Kelvins when the surrounding gas temperature is around 1000 degrees K. Also presented is an example of applying the calculated results to a combustion analysis of a diesel engine. This example illustrates that in calculating the burning rate from a pressure diagram, the effect of fuel evaporation must be taken into account.

by Takeyuki Kamimoto; Shin Matsumoto
Tokyo Inst. of Tech., Dept. of Mechanical Engineering,
Tokyo, Japan
Rept. No. SAE-770413; 1977; 12p 10refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

IS-023 955

THE DEVELOPMENT OF QUALITY INFORMATION SYSTEMS IN AUTOMOTIVE ASSEMBLY

The system design and method of evaluation are discussed for two experiments which were run in automotive assembly plants in an attempt to develop more effective quality control systems. The first experiment involved the establishment of special teams (an industrial engineer, a plant staff engineer, and a plant foreman). The teams were assigned to each of five sections in the plant to analyze the inspection data from its area in order to identify those operations which had been producing defective output over 10% of the time and to initiate steps to reduce the number of defects. The second experiment involved the same type of analysis using line production personnel (Superintendent of the zone, Quality Control Manager of the plant, Quality Control Superintendent of the trim area, and a Quality Control Engineer) and involving only the trim area of the plant. In both experiments, especially the second, it was found that many of the defect sources were known, yet there seemed to be little incentive to reduce defects until a method of evaluating improvement was introduced. Since the method of evaluation (first-time defect rate) excluded the rework-management effort solution (add more repair capability), the line management in the second case, and the project group in the first case exercised considerable initiative in reducing the over-10% defect items. The line supervision, when charged with reducing the first-time defect rate, had ample resources to do so. In addition, they were able to effect changes more quickly and with less negative reaction than the project team in the first experiment. Therefore, charging line supervision with reduction of first-time defects is the preferred method. In both experiments, knowledge of warranty costs were available but ineffective because the people involved could not use the cost figures for cause-and-effect purposes; the participants in both projects ceased even to discuss warranty costs after first-time defect data were available. Analysis of first-time defect rates revealed many organizational deficiencies, such as parts not being supplied, parts not made to specification, lack of control of critical processes, excessive absences, lack of proper inspection standards, and lack of proper location of inspection and repair personnel. First-time defect analysis, therefore, becomes a primary measure of organizational effectiveness. In the second experiment, the Superintendent was faced with a weekly evaluation of his efforts which caused him to improve the use of his time and other resources. Since the incidence of repairs will take months or even years to be brought to minimum levels, the development of a system to provide plant management with an incentive to continually

reduction mechanism.

by Walton M. Hancock; Francis E. Plonka
University of Michigan; Wayne State Univ.
Rept. No. SAE-770414; 1977; 8p
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

IS-023 956

A PROGRAM FOR PREDICTING AND CONTROLLING CARBURIZATION RESPONSE

The theoretical and empirical bases are presented for a computer program which predicts quenched hardness distributions in slabs and bars of steel of arbitrary dimensions and composition subject to a carburization regime with arbitrary time variations of carbon (C) potential and temperature. The program specifically allows for the following: variation of the gas C potential in time and temperature to accommodate boost-diffusion and post-diffusion cycles and faster or slower diffusion; choice of C potential input as an infrared CO₂ (carbon dioxide) concentration or a dew-point reading; correction to the effective C potential to account for the effects of surface reaction inhibition and alloying of the steel; a solution of differential equation for C diffusion in austenite which accommodates a time-variable surface concentration and a concentration-dependent diffusion coefficient; a predictor of Jominy hardenability which is accurate for the C range 0.07% to 1.3% by weight of C and for the entire low-alloy range, and which incorporates the effects of retained austenite in the high-C range; and an empirical equation (Lamont's published empirical relations) for the transformation of the results of the previous two calculations to hardness distributions in slabs and bars of variable dimensions obtained by quenching in media specified by their severity of quench. The hardenability of steels was calculated using the Minitech Jominy Hardenability Predictor, accurately calibrated for SAE H-steels and for tool steels with carbon contents of 0.07% to 1.3%.

by J. S. Kirkaldy
McMaster Univ.; Minitech Ltd., Box 5185, Station P,
Hamilton, Ont., Canada
Rept. No. SAE-770415; 1977; 14p 16refs
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

IS-023 957

LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS

The bending fatigue, Charpy impact, impact fatigue, and metallurgical properties of carburized SAE 8620, EX (experimentally) 10, EX 15, and SAE 1524 steel gears were evaluated to determine if equivalent hardenability is a criterion sufficient to merit the substitution of 8620 with EX 10 and EX 15 for gearing applications. A number of steel suppliers are promoting low-alloy steel compositions (EX category) for common carburizing steels, particularly 8620. The cost reduction of EX grade steels is achieved by a reduction or elimination of the nickel (Ni) present in the 8600 series and other steel grades. Any hardenability lost by a reduction of Ni is compensated by an increase in the manganese (Mn) content. EX 10 has reduced Ni, chromium (Cr), and molybdenum (Mo) con-

pared to 8620. EX 15 differs from 8620 in that Ni is totally eliminated as an alloying element and Mo is slightly reduced. In EX 10 and EX 15, the loss in hardness resulting from the reduction in alloy elements is compensated by a substantial increase in Mn content. If the philosophy of replacing alloying elements with Mn to achieve equivalent hardness is taken to the furthest extreme, carbon (C) steel having a chemistry range essentially equivalent to 1524 would result. For that reason, 1524 was included in this study as a control sample for the alloy evaluation. Samples of SAE 4817 alloy were also included to firmly establish the value of high-Ni or no-Ni alloys, thus providing a datum point at the other end of the alloying spectrum. Tests run on actual gear teeth using a unique test fixture showed that the impact requirements of each application must be considered. Equivalent hardness is not always a sufficient criterion to merit the direct replacement of 8620 by EX 10 and EX 15. If the impact properties of a candidate replacement steel are found to be comparable to 8620 and a materials substitution is made, care must be taken to insure that the impact properties of the steel are not altered during heat treatment. Carburized gears cut from higher hardness 8620 and EX 15 steel bar had longer impact fatigue lives than gears cut from EX 10 and 1524; the opposite was true with respect to bending fatigue performance. The Charpy U-notch toughness of 1524 and EX 10 was found to be significantly lower than 8620H at all test temperatures. EX 15 had toughness and impact properties comparable to 8620H when test temperatures approached 175 degrees F. The carburized Charpy U-notch toughness of EX 10 was found to be comparable to 8620H throughout the temperature range. The Ni-free grades EX 15 and 1524 tended to develop .03% to .07% higher surface C content than the Ni-alloy steels when processed under the same carburizing atmosphere; it is advisable to process EX 15 and 1524 at a slightly lower C potential than normally employed for 8620 grade to minimize retained austenite. The Charpy impact properties and impact fatigue life of carburized 4817 steel were found to be superior to 8620, EX 10, EX 15, and 1524.

by Dennis Vukovich; Richard Pierman; Mark Matovina
Eaton Corp.; Manufacturing Technology, Inc.
Rept. No. SAE-770416; 1977; 14p
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 959

AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY

A method of vehicle performance measurement has been developed to permit selection of optimum fuel economy/performance trade-offs for a vehicle having various powertrain components. The method, called the "Optimum Performance Versus Economy Line" technique, was utilized in an analytical study of drivetrain component features such as overall ratio range, number of ratio steps, locked converters, continuously-variable drives, etc. Emissions and drivability were not considered. Both manual and automatic types of transmissions were included; for manual transmissions, three 4-speed units and one 5-speed unit were investigated; the basic automatic had 3-speed Simpson type gearing with a conventional hydraulic torque converter. The simulation used to represent a continuously variable transmission was an automatic unit having 12 equally stepped geared ratios. Indicators

are that ratio range is an important consideration of transmission design parameters and that conventional transmission concepts can be competitive with the more exotic continuously-variable-type units.

by Howard E. Chana; William L. Fedewa; John E. Mahoney
General Motors Corp.; Engineering Staff
Rept. No. SAE-770418; 1977; 11p 2cels
Presented at International Automotive Engineering Congress
and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-023 959

EFFECT OF TREATED CELLULOSE FIBERS ON CRACK GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS [TIRE TREADS]

Experiments were conducted to investigate the effect of short-fiber reinforcement on crack growth and cutting and chipping of the tread compounds. The effect of fiber loading was studied using one type of treated short fiber, Monsanto's Santoweb DX, with an average length of about 1 mm to 1.5 mm and major and minor ribbon diameters of 15 and 5 micrometers respectively. Tests were made using conventional compounds of natural rubber (NR), styrene butadiene (SBR), and an oil-extended SBR/polybutadiene (BR) blend. All were carbon-black-loaded in addition to the short fiber reinforcement. Two cure systems were used in the NR and SBR compounds, a conventional high-sulfur/low-accelerator ratio and an intermediate-sulfur/high-accelerator ratio. It was shown that the addition of small amounts (less than or equal to 2%) of Santoweb DX markedly improves the resistance to crack growth. Treated cellulose fiber reinforcement at the same range of concentration also improves laboratory cutting and chipping resistance. When short fibers and additional oil are added for cost reduction reasons, the compounds are superior for crack growth resistance. Cutting and chipping resistance is improved at 6:8 fiber/oil levels and then decreases slightly at 8:10 and 10:12 fiber/oil levels, respectively. This is accomplished with minimum changes in processing and curing behavior. Physical properties are either not affected or affected only marginally.

by J. R. Beatty; P. Horned
Publ. Elastomerics v10 n8 p27-34 (Aug 1978)
1978; 7refs
Presented at meeting of American Chemical Society, Rubber Div., Montreal, 2-5 May 1978.
Availability: See publication

HS-023 960

PRODUCT ENERGY IN THE RUBBER INDUSTRY

Product energy is the energy required to make a product or a unit of bulk product, the sum of raw material, direct and indirect plant energies, and scrap and defect energies. It is usually expressed in terms of Primary Energy: the energy of the basic fuel used, oil, gas, or coal. It does not include the energy required to get fuel out of the ground, but the energy of all factory operations and huck-up stuff is included. The main use for Product Energy data is in costing. Product Energy covers: the energy content of raw materials including the energy to transfer to the plant where they are to be used; the energy put into mixing and processing of product in the plant; energy used in the plant, including offices and other facilities,

not directly related to specific manufacturing operations (applied to operations by some pro-rating method); and the energy lost when the product is scrapped at any stage of production. A series of tables presents: a breakdown of primary energy of a typical rubber product; the energy value of four fuels (coal, No. 6 fuel oil, natural gas, and liquefied propane); the typical energy content of polymers and compounding ingredients; the energy content of metals; typical energy content of fibers; the energy to produce utilities; and the typical primary energy requirements for rubber or rubberlike plastic processes (direct plant energy). In working with primary energy in costing, it will be necessary to show a composite fuel cost based on the BTU value of fuels used and an estimate of the portions of each used to make the product, a procedure somewhat inaccurate but suitable for general broad studies. For the direct plant energy cost, the area of most importance to product engineers, more accuracy is required, so the actual cost of each form of energy used, whether kWh of electricity, pounds of steam, etc., should be reported. Programs by product engineering groups are needed to help in reducing direct plant energy.

by Frank Burton

Publ: Elastomerics v10 n3 p22-5 (Aug 1978)
1978

Availability: See publication

HS-023 961

HELPING SPEEDERS BEAT THE RADAR RAP

Police efficiency in identifying speeders has risen with the advent of moving radar, which allows police cars to single out speeding drivers while maintaining normal patrol of highways. Signal-processing circuits within such radar automatically subtract the ground reflection frequency from the closing speed reflection frequency to determine the suspect vehicle's speed. Because of the fast closing speed and element of surprise, moving radar is much more effective than stationary radar. Of the dozen or so small companies making radar detectors the largest and most aggressive is Electrokt, Inc. of Troy, Ohio, founded by Dnie Smith, inventor of the "Fuzzbuster". His belief that police radar is often misused or misinterpreted has led him to question the evidentiary status of radar in the court system and to act as a consultant or expert witness for motorists accused for possession of radar detectors. As very low signal levels are involved, "falsing" is a serious problem for all concerned; CB transmissions, automobile electrical systems, and nearby aircraft radar can cause interference. Until now no performance standard has been set for radar manufacturers; however, in March 1978 it was announced by National Hwy. Traffic Safety Administration that performance standards for police radar and other traffic law enforcement speed measuring devices would be developed during the next three years, and a list established of qualified products meeting these standards. Legislation prohibiting the manufacture, sale and use of radar detectors has been declared unconstitutional. The passive radar detector, lacking a local oscillator, modulates the received signal while it is being detected. A new type of detector uses a heterodyne technique; its advantages are said to include improved sensitivity, more immunity to falsing, and elimination of the manual sensitivity control.

by Don Munnie

Publ: IEEE spectrum v15 n3 p38-42 (Aug 1978)
1978

Availability: See publication

HS-023 962

AUTOTEST ADVANCES

The development of a fifth wheel, attached to a car for speed measurement, is traced from the late 1940's, when Autocar's technical staff first used one, to the present. Difficulties of attachment and accuracy have led to the use of Corvett, a new Leitz optical speed measuring device, using optics combined with electronics to measure the speed of a surface relative to something else. The image of the road surface is focused on to a series of parallel slits formed by a prism grating—a row of triangular-section lengths of glass. The prisms split the image of each road surface particle between two photo detectors; the resulting waveform is a mixture of two waves—the relatively low, random frequency one caused by any large areas of light and dark road, and a much higher frequency of very much lower amplitude (strength) produced by the particles of the road surface. Digital electronics are then arranged to cancel out the low frequency and average the high frequency to provide a constantly up-dated measure of speed. Photographs and diagrams explain the arrangement of the assembly, a road-reading "camera" with accompanying lamp unit, and a digital control unit inside the car with readouts displaying speed, distance and time. An accurate form of brake testing is also possible. With Corvett Q, speed sideways as well as forward can also be measured. Additional information is given on changes in Autocar Road Tests, chief of which is a replacement of the previous compact table of competing car statistics with a more detailed comparison of the test car with five competitors.

by Stuart Bladon; Michael Searlott

Publ: Autocar v149 n4256 p31-3 (12 Aug 1978)
1978

Availability: See publication

HS-023 963

GAS TURBINES -- A BRIEF REVIEW OF BASIC TYPES

The attributes of a gas turbine, and basic ways to improve its efficiency, are discussed. The limitation of the simple single-shaft unit is that the speed/load characteristics are very restricted; it is suitable for base load, fixed frequency, and steady load electrical generation work, but not for any application where changes in load demand and/or speed are part of regular operating routine. Advantages of the two-shaft configuration are that the compressor can run at the most efficient speed, without the limitations of a fixed output speed, and can slow down at part load so that less air is delivered to the combustion chamber to match the reduced fuel input and so maintain the thermal efficiency. The sudden application of an overload to the output shaft will not stall the plant, but will merely slow down the power turbine, which will automatically develop more torque as its speed falls. At standstill it will have a torque of at least double the normal full-load value, useful for applications where the load has to be started from rest. A three-shaft arrangement allows separate drives for the high- and low-pressure sections of the compressor; the high-pressure turbine drives the high-pressure compressor, the low-pressure turbine drives the low-pressure compressor and an intermediate pressure turbine drives the actual power-output shaft, an arrangement suitable for a large generating plant, as the low-pressure high-volume section can run at high speed. These are all open-cycle arrangements: air is drawn in from the atmosphere and finally the burnt gases are exhausted to it again.

In closed-cycle gas turbines, the working fluid is continually recycled; disadvantages of this cycle are the size, the very large cooling requirements and inherent temperature limitations of the air heater. Advantages include a much wider choice of fuel, with possible use of a fluid other than air, and the separation of the working fluid from the atmosphere so that some degree of nuclear radiation contamination could be tolerated. Closed cycle machines can work for long periods without attention, as a clean working fluid is used all the time, reducing blade corrosion and wear. Temperature limitations are imposed by the separate combustion chamber. As the size of an axial flow turbine increases, the single chamber becomes too bulky and must be replaced by several smaller ones, spread round the circumference; the ultimate arrangement is an annular combustion chamber, as used in aircraft work. Seven diagrams illustrate some of the possible cycle arrangements met with in practice.

Publ: Engineering v218 n8 p768-71 (Aug 1978)
1978

Availability: See publication

HS-023 964

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS

The effects on fuel economy, regulated and unregulated exhaust emissions, drivability, acceleration, passenger car safety, consumer acceptance, and other variables due to the installation of light-weight diesel powerplants were studied. Experimental data were obtained on naturally aspirated and turbocharged diesel engines installed in subcompact and compact passenger vehicles. The data include fuel economy as a function of engine type and horsepower, transmission layout, vehicle inertia, weight, and of regulated emission constraints. Unregulated emissions have been characterized during the course of the work. The compatibility of the diesel engines studied with passenger car structures incorporating advanced frontal crushworthiness capabilities was analyzed and demonstrated with the Integrated Research Vehicle. It was concluded that the installation of diesel engines complies with the applicable safety requirements and does not entail significant changes in vehicle geometry, weight, performance, and drivability, while the use of diesel engines can contribute significantly to energy savings because they feature good fuel economy and will meet emission standards of 41 g/mi HC (hydrocarbon), 3.4 g/mi CO (carbon monoxide), and 1.5 g/mi NOx (nitrogen oxides). Fuel economy, lower maintenance costs, and a longer service life more than compensate for higher initial cost of a diesel powered vehicle.

by B. Wientemann; P. Hofbauer
Volkswagenwerk AG
Rept. No. SAE-780634; 1978; 27p 11refs
Presented at Passenger Car Meeting, Troy, Mich., 5-9 Jan 1978. Research contracted by Dept. of Transportation See final report, DOT-TSC-NHTSA-77-3, 1. Technical Paper Series.
Availability: SAE

HS-023 965

PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE

Automotive and electric vehicle technologies are considered, with special emphasis on the power train, in order to identify

an "optimum" power train, to predict its performance, and to identify and evaluate improvements for increasing vehicle performance. Several configurations and combinations of off-the-shelf components were suggested by a study of existing electric vehicles, a review of related technology and an application of engineering judgment. The candidate electric vehicle power trains were evaluated quantitatively and by computer simulation to identify the system which can achieve maximum range over the SAE J227a Schedule D driving cycle. Such a state-of-the-art power train would employ regenerative braking and would consist of a series wound DC motor, SCR chopper controller, electrically controlled V-belt continuously variable transmission, radial tires, and drum brakes. Analysis predicts that a vehicle weighing 1,587 kg (3500 lbs.), using 16 EV-106 lead-acid batteries and employing this power train would achieve a range of about 50 km (31.2 miles) over the Schedule D cycle. A power train based on a separately excited shunt wound DC motor will achieve about 20% greater range over the SAE cycle than one with a series wound motor. In order to implement this system, technical development is needed in the areas of higher speed, shunt wound motors and electrical controllers featuring both armature and field control. Even with power train components which are perfectly efficient, a highly streamlined 1633 kg (3600 lbs) electric vehicle, with state-of-the-art tires, would have a range of only 96 km (60 mi) over the SAE cycle. In order to significantly extend range, improved batteries, expanded use of lightweight materials and low rolling resistance tires are needed.

by Phillip Mudgeall; William F. Hahn
Benz, Allen and Hamilton Inc., Design and Devel. Div.,
Cleveland, Ohio 44131
NAS-3-26595
Rept. No. DOE/NASA/0395-78/1; NASA-CR-133341; 1978;
150p refs
Prepared for NASA for Dept. of Energy. Electric and Hybrid Vehicle Systems Program, under Interagency Agreement EC-77-A-31-1084.
Availability: Corporate author

HS-023 966

HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977

About 9:35 a.m., e.s.t., on 24 Sep 1977, an Usher Transport, Inc., tractor-cargo-tank semitrailer was descending a 1248', 720-foot-long grade approaching a left curve and a railroad/highway grade crossing on Kentucky State Route 11 in Beattyville, Kentucky. The truck, which was hauling 8,355 gallons of gasoline, crossed the tracks against the flashing red lights and in front of an approaching train, and struck buildings adjacent to the edge of the road. It then overturned on top of a parked car. Escaping gasoline ignited and the fire destroyed 6 buildings and 16 parked vehicles. Seven persons died in the fire. The National Transportation Safety Board determines that the probable cause of this accident was the loss of vehicle control because of speed excessive for highway geometry. Contributing to the accident was the truck driver's lack of judgment when he failed to respond to the warnings and obey the rules of the road. Recommendations include an immediate ban on parking in the area concerned, installation of more effective warning signs; improvement of the surface of the railroad/highway grade crossing and superelevation of the

where restrictive geometric conditions exist; a review of similar downgrades to assure proper advance warning signs; development of implementation of the findings of the PIWA study; analysis of Cargo Tank Integrity in Rollovers; and research the feasibility of installing energy attenuating devices capable of decelerating large runaway vehicles on steep grades where the use of adjacent property prohibits the installation of truck escape routes.

National Transportation Safety Board, Bureau of Accident Investigation, Washington, D.C. 20594
Contract No. NTSB-HAR-78-4; 1978; 29p 4refs
Availability: NTIS

62-927

CORROSION RESISTANT STEEL AND NONFERROUS MATERIALS FOR METRIC FASTENERS

New metric fastener standards for Corrosion Resistant and nonferrous materials have been developed by the Industrial Fasteners Institute's (IFI) Standards and Technical Practices Committee. IFI 516 - Mechanical and Material Requirements

Metric Externally Threaded Fasteners in Corrosion Resistant Steels and IFI 517 Mechanical and Material Requirements for Metric Nuts in Corrosion Resistant Steels, describe mechanical and material requirements for products selected from 16 grades of corrosion resistant steel: 9 austenitic, 2 ferritic, 4 martensitic and one precipitation hardening grade, in sizes M 3.5 to M 36, suitable for use in general engineering applications. Description, characteristics and uses are provided. IFI 518 - Mechanical and Material Requirements for Metric Externally Threaded Fasteners in Nonferrous Alloys and IFI 519 - Mechanical and Material Requirements for Metric Nuts in Nonferrous Alloys establishes mechanical requirements based on performance of externally threaded fasteners and nuts made from 27 grades of nonferrous alloys: one copper, 13 copper alloy, 5 nickel alloy, 3 aluminum alloy and 5 titanium in sizes M 3.5 to M 36, suitable for use in general engineering applications. Description, characteristics, and uses are given of brasses, silicon bronzes, naval brass, aluminum, nickel base alloys and titanium. Tables are provided showing mechanical and material requirements with chemical composition limits, and a chart indicating the relationship of the American National Standards Institute to the International Organization for Standardization.

Joseph S. Orlando

T Harper

Contract No. SAE-770419; 1977; 10p 2refs

Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.

Availability: SAE

62-928

PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS

A self-administered questionnaire was used to compare selected demographic, drinking and psychosocial variables of 66 convicted drunken drivers (group D) with those of 269 alcoholics (group A) and 269 controls (men who came in to renew their driver licenses, group L). The alcoholics were significantly different from the control group on virtually every variable, drinking beer and distilled spirits more often and in

larger quantities, drinking more to relieve tension than for social relaxation, experiencing more troublesome and comfortable effects from drinking, having more stress in their lives, more problems with their families and jobs and more use of sleeping pills and tranquilizers, and participating less in leisure time activities other than drinking. They also were less responsible, had less self-control, had a more external locus of control and were more depressed and suicidal than the controls; had less self-esteem, were more paranoid and aggressive, used oral substances more and nonoral means less for coping with tension and depression. Age is an important factor in the alcoholic group: the 45-and-older group were more responsible, significantly less depressed, paranoid, suicidal, and had fewer problems with their families and jobs than the younger group. Similar age differences were not found in the control group. Data on the men arrested for drunken driving were less clear-cut. They fell between the other two groups on many parameters, but resembled the control group on as many others. They drank significantly less alcoholic beverage than the alcoholics, but significantly more than the control group, and were similarly different in motivation for drinking and its perceived consequences. In stress measures and personality variables they were similar to the control group, but distinguishable from them in a variety of ways: were heavier drinkers, experienced more troublesome effects from drinking, were more depressed, less responsible, had less self-esteem, and were more paranoid and aggressive, than men coming in simply to have licenses renewed. Clearly this group of men convicted of drunken driving are not random members of the population who happen to be caught on one occasion; they need relatively sophisticated rehabilitation programs, and should not be treated as homogeneous with alcoholics.

by Melvin L. Selzer; Amiram Vinekur; Timothy D. Wilson
NIAAA-AA60495

Publ: Journal of Studies on Alcohol v38 n7 p294-312 (Jul 1977)

1977; 19cfs

Availability: See publication; Melvin L. Selzer, M.D., Riverview Bldg., 900 Washt St., Ann Arbor, Mich. 48105

HS-023 969

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED

A study was made to test whether men with first arrests and men with second arrests for driving while intoxicated provided comparable retrospective descriptions of their moods during the months preceding their arrest. A sample of 66 men, of whom 28 had one previous arrest for driving while intoxicated and 38 had no previous record, was drawn from one month's consecutive admissions to the Diagnostic and Evaluation Unit of the City of Philadelphia's Alcohol Highway Safety Program. According to a diagnostic interview covering general background information and drinking behavior during the month before the arrest, the difference between the mean daily alcohol consumption of first and second offenders during the month before arrest was not significant, nor was an age difference considered to be related to these offenders' moods. Results indicated that the first offenders experienced more negative affect in the month preceding their arrest for drunken driving than did the second offenders, with more tension, anger and fatigue. These findings provide further evidence that different levels of negative affect may exist in persons arrested for driving while intoxicated, and these moods may be

associated with different types of offenses. The retrospective design of the study prevents conclusions about differences in the pre-arrest mood of the subjects tested. Increasing sophistication should be introduced into evaluation of drunken drivers.

by Robert A. Seear; Eric W. Fine
Publ: Journal of Studies on Alcohol v39 n5 p222-5 (May 1978)
1978; 11refs
Study from the West Philadelphia Community Mental Health Consortium, P.O. Box 8876, Philadelphia, Pa. 19101
Availability: See publication

HS-023 970

OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS

Data gathered from participants in an educational program for persons convicted of impaired driving were used to measure changes in two cognitions, "self-concept" and "alcoholic concept", as a result of the program. According to self-concept theory, people try to preserve a positive self-image. An alcoholic who denies his/her alcoholism will therefore view himself/herself positively. Socially, alcoholics are viewed as weak, dangerous, and ill. Consequently, the equating of "self" with "alcoholic" is inconsistent and can be expected to produce dissonance, in this case, denial. To evaluate the education program, during the first and last class of the 11-week program, the subjects (43 men) were administered a 6-point semantic differential rating scale which used the concepts "alcoholic" and "me". The rating was done on 13 bipolar adjective scales (good-bad, active-passive, fair-unfair, large-small, tense-relaxed, honest-dishonest, hard-soft, busy-lazy, pleasant-unpleasant, excitable-calm, useful-useless, understandable-mysterious, and familiar-strange). The program covered the following five main topics: physical effects of alcohol consumption, psychological mechanisms, social causes and effects of heavy drinking, legal implications of impaired driving, and identification of methods available for changing drinking patterns. The subjects' self-concept appeared to be much more positive than their "alcoholic concept", although the participants did have a more positive view of alcoholics by the end of the program. Smaller preprogram differences were found in the dimensions related to stress-tension and excitability, and by the end of the program these differences were insignificant. In general, the largest differences between the self and alcoholic concepts were on the evaluative factors. Although the two concepts became increasingly similar after the program, as a result of apparent alterations in the alcoholic concept, a significant difference remained, partly due to an unaltered self-concept. Altering the self-concept is a formidable task.

by M. Pennock; L. M. Poedriar
Publ: Journal of Studies on Alcohol v39 n5 p218-21 (May 1978)
1978; 11refs
Availability: See publication

HS-023 971

AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROADWAY INPUTS

An analytical and experimental study was conducted of ride vibrations in an intermediate sedan automobile over roads of various degrees of roughness. Roadway roughness inputs were measured with a General Motors Surface Dynamics Profilometer.

Five different mathematical models were employed to predict the acceleration response of the vehicle body. The models included two, four, and seven degrees of freedom, primarily for vertical direction motion. The results show that the prime source of errors in predicting responses of this type lies in the common assumptions made for roadway roughness spectra. With adequate description of the roadway inputs, the results show that the seven-degree-of-freedom model accurately predicted the low-frequency response (up to 10 Hz). Using the seven-degree-of-freedom model, predicted acceleration compare well with measured data for a wide range of roadways in the low-frequency range. Higher-frequency components in the measured acceleration response are significant. Beyond 10 Hz, other excitation sources, possibly related to tire unevenness, can cause the root mean square acceleration response to double.

by A. J. Henley; E. Nathman; C. C. Smith
DOT-OS-30093
Publ: Journal of Dynamic Systems, Measurement, and Control v99 Series G n4 p284-92 (Dec 1977)
1977; 19refs
Transactions of the ASME.
Availability: See publication

HS-023 972

TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS

Faced with skyrocketing liability costs and the year-to-year threat of policy cancellations, U.S. tank truckers are considering banding together for group insurance coverage in a last-ditch effort to lower premium rates and increase liability protection limits. If successful, the group liability move will be the first of its kind in the transportation industry. Many tank-truck industry leaders feel the group insurance movement may be the start of a trend that will spread throughout the trucking industry, which has been hard-hit on all fronts in the insurance crunch. The so-called "high-risk" nature of the trucking business, bulk hauling in particular, has caused many U.S. insurance companies to drop out of the transportation market in recent years. Specialty companies that cater to transportation business are small, few in number, and generally unable to handle all of the high levels of coverage needed by an industry that moves most of the nation's petrochemical products. Yet the domestic insurance market either unwilling or unable to provide the high liability coverage needed by tank truckers, the industry has turned to Lloyd's Underwriters in London to group excessive coverage up to \$50 million.

by Thomas W. Duncan
Publ: Fleet Owner v73 n7 p76-83 (Jul 1978)
1978
Availability: See publication

HS-023 973

SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY

A 355 timer can control an automobile's windshield-wiper rate by providing a selectable delay time between wipes. The timer uses a feedback signal from the cam-operated wiper within the wiper motor to synchronizing the delay time to a position of the wiper blades, as measured from their start point. With synchronization, the minimum delay time can vary

ke reliably kept to nearly zero (normal delay for standard systems), which is best for heavy rain. Synchronization also ensures that the delay time is independent of the wiper speed across the windshield. The maximum delay time in this circuit can be set to about 22 sec., which is suitable for mist or light drizzle, or to any value desired, by suitable selection of the 555's timing components. This circuit offers a better approach to synchronous-delay wipers than those that use silicon controlled rectifiers in parallel with the cam switch, because cam-switch voltage is affected by dirt and grease. A circuit is shown for a Volkswagen Rabbit, or any car that has one end of the wiper motor always grounded (which requires a positive energizing voltage). Also provided is a suggested modification of the wiper delay circuit to handle cars with a reversed wiper-motor configuration in which one end of the wiper motor is always connected to the positive ignition-line voltage and so requires a connection to ground to energize it.

by John Okolowicz

Publ: Electronics v50 n24 p115, 117 (24 Nov 1977)

1977

Designer's Casebook.

Availability: See publication

HS-023 974

TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT [INDIANA HIGHWAYS]

In the continuing study of vehicle speeds on Indiana highways, observations of spot speeds were taken of automobiles and trucks on rural, tangent, level sections of interstate, four-lane, and two-lane highways and on urban interstate highways throughout the state during the Apr-Jun 1978 quarter. Analysis of the speeds show the overall average speed for all vehicles was 58.1 mph. The overall average speeds for passenger cars and all trucks were 58.4 mph and 57.9 mph, respectively. These overall speeds indicate little change in speeds since the Jan-Mar 1978 study (Speed Report No. 104). The average speed of passenger cars has fallen 0.6 mph, while the average speed of heavy trucks rose only 0.1 mph when compared to the previous period. The percentage of all vehicles traveling more than 5 mph above the speed limit decreased to 31.1%, while 8.3% were more than 10 mph above the speed limit, a decrease of 1.7%.

by J. R. Mekemson; G. K. Stafford

Purdue Univ., Joint Hwy. Res. Proj., Civil Engineering Bldg., W. Lafayette, Ind. 47907

HPR-1(15)-Pt-1

Rept. No. JHRP-78-14; 1978; 47p

Rept. for Apr-Jun 1978. Conducted in cooperation with Indiana State Hwy. Commission, and Federal Hwy. Administration (under a planning study titled Speed Trends for Indiana Highways).

Availability: NTIS

HS-023 975

1978 MOTORCYCLE STATISTICAL ANNUAL

Statistical data on the U.S. motorcycle industry and population in 1977 are provided, as well as some historical data. The information is presented in the following sections: the motorcycle market (population by model type, engine displacement, year; population and penetration by region and state; registrations by year and by state; economic value of the retail marketplace by state; new sales summary; imports by year,

country, engine displacement; new wholesale sales by major brands, new registrations by state and by leading brands); manufacturers and distributors (including mopeds); the motorcycle aftermarket (years in business and motorcycle-related sales; aftermarket retail outlets and other industries served; on selling aftermarket products; financing of aftermarket sales); the retail marketplace (retail outlets by state; dealer profile and estimated dollar volume; distribution of dealer sales, customer and flooring financing); motorcycle usage (on- and off-highway by state; street usage, commuting and other purposes; miles traveled, on- and off-highway mileage by model type; miles traveled, model type by on- and off-highway mileage; average annual mileage; scrapage and operability rate; operating and ownership costs of the motorcycle and automobile; accident statistics by state; rider education programs; state operator licensing procedures; state equipment requirements) and the motorcycle owner (number of owners/riders, sex, marital status, age, education; owner occupation, income, motorcycle ownership). A subject index is provided.

Motorcycle Industry Council, Inc., Res. and Statistics Dept.,

4100 Birch St., Suite 101, Newport Beach, Calif. 92660

1978; 32p refs

Availability: Corporate author \$3.50

HS-023 976

NEW SENSORS FOR AUTOMOBILE ENGINE CONTROL

New sensors are nearing production for use in automotive engine control systems. The sensed parameters include absolute and differential pressure, contacting and noncontacting angle pick-offs (i.e. crankshaft and throttle), air and fuel flow, oxygen partial pressure, and temperature. These sensors have moderate but long-term accuracy. Generally self-contained, they produce a high level output and can survive a near military environment. Their mass production at low cost will produce major changes in the instrumentation industry. Development of sensors has been promoted because of emission control and fuel economy requirements. A table of engine control parameters is provided, indicating for each the operating concept and status (experimental, prototype, or production).

by W. G. Wolber

Publ: Instrumentation Technology v25 n8 p47-53 (Aug 1978)

1978; 12refs

Based on a paper presented at ISA Aerospace Industries and Test Measurement Divisions Symposium, Albuquerque, N. Mex., 1978

Availability: See publication

HS-023 977

SAFER DRIVING WITH NEW CAR RADAR

Two prototype automotive collision-avoidance systems are described, developed by Bosch and Mercedes-Benz under the sponsorship of the German government. Bosch's system (developed in conjunction with AEG-Telefunken) uses pulse radar; an endless stream of 20-nanosec impulses are beamed ahead from the transmitting antenna. These are reflected by any solid object in their path, and the faint echoes are picked up by a separate receiving antenna and amplified. Evaluation circuits measure the two-way travel time of each pulse; that

number establishes the distance to the object. Further electronic circuits figure in the vehicle speeds and other governing factors controlling the warning display and alarms. Measuring accuracy is within 1% error at maximum range. Remote inputs, such as a potentiometer on the steering system, brakelight switch, and "dry/wet/ice" selector, are used to change the calculation slightly, compensating for actual conditions. A key factor in this collision-avoidance system is an ability to discriminate between obstacles actually on the road and nonhazardous off-road objects such as bridges, traffic signs, and fences. There is still some risk of false signals, particularly from stationary roadside objects on tight bends. To date Bosch engineers have fitted several cars with the experimental radar and covered more than 60,000 test miles under all conditions. They are content with the results, and development work is continuing. Mercedes-Benz' system (developed in conjunction with Standard Elektrik Lorenz) is continuous-wave, frequency-modulation radar. With this system, distance and speed are measured by the time between the transmission of two frequencies and the frequency shift in the returning echo. Unlike the Bosch pulse system, the Mercedes-Benz Doppler system indicates both distance and relative speeds with one radio signal, without having to derive one quantity from the other. The equipment is less complex and therefore cheaper. Speed measurements, to within 0.6 mph, are more accurate than pulse systems, though distance accuracy is lower. Better rejection of unwanted echoes is cited as an important plus for the Mercedes-Benz system. On curves, the beam range is restricted according to steering angle, as is the Bosch system. The Mercedes system can also process its two-frequency-shift signal components to distinguish between moving and fixed targets on the road edge where the beam might possibly reach in some cases. On straight roads, however, the radar responds to anything in the lane ahead.

by David Scott

Puhl: Popular Science v213 n2 p45, 50, 52, 54 (Aug 1978)
1978

Availability: See publication

ITS-023 978

TWO-WAY RADIOS PAY OFF FOR TENNESSEE DISTRICT [SCHOOL BUSES]

A two-way radio communications system installed in new school buses of the Sumner County School District in Tennessee has aided in speeding emergency operations when school bus accidents have occurred and has also proved useful in dealing with minor problems and managing Sumner Schools' routine transportation operations. Currently 55 vehicles of the 140-bus fleet are equipped with Motorola units, including all special-education vehicles. The fleet handles 120 routes daily, serving 35 schools in the predominantly rugged rural terrain of the 540-square-mile county. The cost per vehicle for radio equipment is less than the price for four rural sites. The hub of the system is a 100-watt RCA transmitter linked to a central garage by telephone lines from its mountaintop location. Some of the system's many advantages include the following: downtime cut in half because of faster maintenance response to breakdowns, one radio-equipped service truck able to do work of two vehicles without radios, drivers work as a team, students not stranded for long periods of time during breakdowns, help within minutes of accident, drivers more confident, discipline problems easier to handle, daily announce-

ments communicated efficiently, and entire fleet stopped or started immediately from supervisor's radio-equipped car.

Puhl: School Bus Fleet v23 n4 p12, 14 (Aug-Sep 1978)

1978; 1 ref

Availability: See publication

ITS-023 979

ADD-ONS REDUCE AIR DRAG [PASSENGER CARS]

An investigation of the effect of add-on devices on the aerodynamic drag and fuel economy of modern passenger cars is reported. The tests were not intended to be exhaustive, and therefore the optimum configurations may not have been always found for the various devices. There is some evidence of interference effects between different devices fitted at the same time, and it is therefore not advisable to assume that each device would give the same drag reduction if it were used in any other combination. With these reservations in mind, some conclusions are drawn. For a modern passenger car of the hatchback style, reductions in drag of up to about 30% are attainable with add-on devices, provided changes in the appearance of the car can be accepted and some practical adjustments can be made. The most effective individual add-on devices are the rear spoiler attached to the roof, and the front spoiler or air dam. Devices which provide relatively little reduction in the drag of such a car include flush-wheel discs, rear-wheel spats, and vanes fitted to the A-posts. An indication of fuel saving from the drag reductions provided by the more effective add-on devices is up to 6%, measured under typical road conditions, with a drag reduction of 14%. Further improvement might be possible if the gearing were altered to take full advantage of the reduced aerodynamic drag.

Puhl: Automotive Engineering v84 n2 p33-5 (Feb 1976)
1976

Based on SAE-760187 "Reducing Fuel Consumption by Means of Aerodynamic Add-On Devices," by G. W. Carr, to be presented at SAE Annual Meeting, Detroit, 23-27 Feb 1976.
Availability: See publication

ITS-023 980

THE STATUS OF MANDATORY PMVI [PERIODIC MOTOR VEHICLE INSPECTION]: THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT

The outlook for mandatory periodic motor vehicle inspection (PMVI) programs in the U.S. is not optimistic at the present time as safety inspections are being ranked second in priority to emissions check-ups. A list of the current PMVI status for each state is presented. Since the last status report (Aug 1977) on PMVI, the states of Wyoming and Kentucky have repealed inspection laws, and, according to the Hwy. User's Federation, repeals are pending in Delaware, Rhode Island, and Ohio. Ten or more states are currently channeling their efforts into vehicle emissions control and inspection. Although the Environmental Protection Agency is working with the Dept. of Transportation to develop an inspection program that would include other factors besides emissions, many observers now think the possibilities of having nationwide, mandatory PMVI (including safety inspections) are remote. Fewer private garages and service stations operate as inspection stations, partly as the result of some deserved bad press. A remarkable program at the Huntsville campus of the Univ. of Alabama shows that inspections can be of value to both the motorist

and independent repair person. Known as Auto Check, the program is one of five demonstration projects authorized by the Motor Vehicle Information and Cost Savings Act, and, since its start in 1975, it has performed about 32,000 inspections on approximately 22,000 Huntsville area cars and has put together probably the most comprehensive data base of its kind. (Tabulated data on system and selected component usage rates for 1968-1973 vehicles are provided.) The program is designed to investigate the condition of cars and trucks in the area, to determine the quality and effectiveness of repairs made by the service industry, and to find out whether an inspection/maintenance (I/M) program has any effect on the area accident rate. Based on an analysis of more than 6000 repeat inspections, Auto Check determined that 3.2% of every dollar spent on vehicle repair was unnecessary, and that 28% of all brake repairs, 22% of all steering repairs, 8% of alignment repairs, and 59% of all disc and drum work were unnecessary. Auto Check also concluded that a mandatory I/M program could reduce accidents up to 11.7%.

by Jeffrey S. Davis

Publ: Brake and Front End v48 n10 p10-20 (Aug 1978)

1978; 2refa

Availability: See publication

HS-023 981

WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

The National Safety Council's Winter Hazards Program at Stevens Point, Wis. included in the latest two-week test period, tests of ice and snow traction of trucks as influenced by drive axle tires, tests of various kinds of tire studs, examination of "nonstandard" tires for traction, and test technique development efforts. For the first time, "strange" or "nonstandard" tires were examined on both ice and snow, specifically tires used on off-the-road recreational vehicles and the relatively new "space-saver" tires. A "controlled penetration" stud and a "low-mass" stud of French manufacture were tested. The controlled penetration stud retracts itself in the event the tire wears faster than the stud. The basic idea behind the low-mass studs is that reduced mass causes less impact and less wear. French-designed studs are claimed to reduce pavement wear by about 80% while being only 4% less effective as traction aids. Testing of these tires was for performance on ice and snow, not for wear characteristics. Special traction trucks which have been used to test passenger tire traction were studied in the hope of adapting them to test truck tires. These traction testing panel trucks have a very extensively modified and instrumented rear axle for mounting the test tire. Vehicle braking and acceleration controls are used to hold the truck at a constant speed while the test wheel is forced faster and faster until it spins. In this testing period, no tests were made on "special compound" tires which are made of different rubber formulations and are aimed at greater wintertime traction, and various traction aids and devices, possibly because such traction aids did not work well in the past. E. A. Whitehurst believes that one long overdue highway safety device is the truck jackknife pretreater; a number of these systems have been tried but none have been effective on ice.

Publ: Traffic Safety v78 n1 p11, 35-6 (Aug 1978)

1978

Based on an article in News in Engineering (Ohio State Univ. publication).

Availability: See publication

HS-023 982

DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE

The rationale behind the early 1970's movement in the U.S. to lower the drinking age to 18 is examined. The impetus for lowering or abolishing drinking-age laws was aimed at establishing the age of majority for voting rather than for alcohol-related issues. Following the adoption in mid 1971 of the 26th amendment extending voting rights in Federal elections to 18-year olds, the extension of all the rights and privileges of adulthood to the 18-year old were examined. Alcohol sales were considered, as well as issues such as making wills, signing contracts, voting, and holding office. The cautions of law enforcement officials who worried about the impact on alcohol-related (A/R) auto accidents by younger drivers, and school administrators concerned about students drinking during school hours were generally ignored. There was no leadership on the national level to challenge state actions on the age of majority legislation. For example, the director of the National Inst. on Alcohol Abuse and Alcoholism (NIAAA) during the time when the drinking age was lowered in 24 states (1971-1975) advocated doing away with all drinking age controls. A review of events during 1971-1973 indicated that lawmakers had made several erroneous assumptions: that there would be little effect of changing the legal drinking age on teenagers' drinking patterns (assuming most teenagers were already using alcohol); less total alcohol consumption following the law change (removal of the glamour of flouting prohibition); no increase in A/R auto accidents among teenagers as a result of lower drinking age (possibly a reduction due to drinking under "supervised conditions", e.g. bars); and few problems in the schools since the "new adults" would have graduated from high school. However, youth-oriented bars began to appear; there was an increase in A/R auto accidents (fatal and personal-injury and property damage) among younger drivers; there were reports of school disturbances, increased drinking among junior high school students, and an increase in arrests for public intoxication. As a result of these A/R problems not only rising 18- to 20-year-olds but also among those under 18, since lowering the legal drinking age, no state has lowered its drinking age since Aug 1973, and since then four states have raised the drinking age. A statewide vote on raising the drinking age in 21 in Michigan appears certain. The ballot is proposed as an amendment to the state constitution, rather than a change in liquor control statutes. This may be a sign of future action in other states.

Publ: Bottom Line v2 n1 p11-6 (Spring 1978)

1978; 3refa

Availability: See publication

HS-023 983

ROAD ACCIDENTS. A COMMUNITY PROBLEM

It is emphasized that those engaged in a serious attack on the road-accident problem need to recognize that there are distinguishable social subgroups in the community that are over-represented in traffic accidents. Miles under the age of 25 are the prime accident participants. Limited studies done to date in various countries indicate that other overrepresented groups in road accidents include people who have routine dealings with the various social agencies, the poorly educated, people with recent personal problems, people with criminal records,

and, of course, the drinkers. High fines or long jail sentences do not cure alcoholism; rehabilitation and treatment (perhaps coupled with punishment) are needed. It is also inadequate to rehabilitate only those alcoholics and drug users who are involved in serious road accidents. It is believed that road safety campaigns should include components directed specifically to groups overrepresented in the accident statistics, that prevention of alcoholism and rehabilitation of alcoholics should be emphasized, and that engineering-oriented measures should be directed toward reducing the effects of accidents (e.g. safer roadways, softer automobile interiors) since some types of people seem to be victims looking for suitable accident sites. Although this third alternative is often cost-effective in the short term, it offers no long-term solutions.

by M. G. Lay

Publ: Transportation Research News #77 p8-9 (Jul-Aug 1978)
1978

Excerpted from a presentation at International Rd. Res. Federation's 1978 Australasian Rd. Conference.
Availability: See publication

HS-023 984

MOTOR GASOLINE SUPPLY AND DEMAND 1967-1978

Statistics on motor gasoline supply and demand in the U.S. during the period 1967-1977 are presented in the following sections: motor gasoline demand, 1967-1977; consumption patterns; supply and demand table, 1972-1977; motor gasoline supply, 1967-1977 (production, imports, stocks); and motor gasoline supply and demand 1978-1979, including preliminary first quarter data for 1978, and the Dept. of Energy (DOE) 1978 and 1979 forecasts. Domestic demand for motor gasoline in 1977 was 2.6 billion barrels, or 7.2 million barrels per day. The 1977 motor gasoline demand showed an increase of 2.6% over the 1976 level, while the demand for total petroleum products increased by 3.2%. The historical steady increase in motor gasoline demand was interrupted in 1974 when it dropped by 3.1% because of the oil embargo of Oct 1973 to Mar 1974. In 1975, motor gasoline demand rose by 2.1%, or a return to the 1973 level. The average annual rate of growth in motor gasoline demand for 1967 through 1977 was 3.8% (3.9% for total petroleum products). Motor gasoline demand accounted for 39.6% of the total petroleum product demand in 1977, a fairly consistent proportion over the study period. Domestic production met 98.0% of the demand in 1976 and 1977. Small amounts of gasoline were imported, and small adjustments to stocks occurred to meet demand. In recent years, there has been a slight decrease in the portion of domestic demand met by production. In 1967, domestic production at refineries supplied 99.5% of the demand. The DOE forecast for 1978 average motor gasoline demand is as follows: high demand, 7.426 million barrels/day, plus 3.9% over 1977; medium demand, 7.418 million barrels/day, plus 3.4% over 1977; and low demand, 7.415 barrels/day, plus 3.1% over 1977. The DOE forecast for 1979 is as follows: high demand, 7.660 million barrels/day, plus 3.2% over 1978 forecast; medium demand, 7.584 million barrels/day, plus 2.2% over 1978 forecast; and low demand, 7.566 million barrels/day, plus 2.0% over 1978 forecast.

HS-023 985

AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES [HUMAN REACTIONS TO VIBRATION]

A matching technique, similar in principle to that employed by Ashley (1970), has been adopted to evaluate equal sensation levels in seated subjects between sinusoidal and wide-band random vibrations, applied in the three translational modes independently. In the first of two experiments, subjects were exposed to four levels of sinusoidal vibrations, corresponding to the 1974 ISO (International Standards Organization) FDP (frequency domain period) 16 min, 25 min, 1 hr, and 2.5 hr boundaries at 6 Hz in the vertical mode, and at 2 Hz in the back-to-chest and right-to-left side modes. Subjects were asked to rate their vibration sensations on a ten-point scale and to categorize their sensations on a four-point category scale (comfortable, uncomfortable, neutral, and very uncomfortable), taking into account the FDP durations. They were then asked to match the random vibration to sinusoidal vibration for an equal sensation effect if exposed over such durations. In the second experiment, the four matched random vibration levels were employed as reference levels. Subjects were then asked to match various sinusoidal vibrations (1 Hz to 20 Hz) to random vibrations to achieve equal sensations, again taking into consideration the stipulated FDP durations. Experiment 1 showed significant differences between random and sinusoidal vibrations at high FDP levels. At these levels, weighted random vibration was more sensitive than sinusoidal vibration. Of the three modes, vertical vibration was found to be the most discomforting. Between the two transverse modes, right-to-left side mode produced slightly more discomfort sensations than the back-to-chest mode. In the second experiment, the results of vertical vibration showed significant differences between the two types of vibrations at frequencies below 3 Hz and above 12 Hz. The contours exhibited increased sensitivities both below 2 Hz and above 12 Hz compared with the ISO contours. In the transverse modes, maximum sensitivity occurred at 2 Hz, below which the sensitivity decreased. Above 2 Hz, the sensitivity decreased much slower than that specified by ISO specifications. The study showed some trends in the change of contour profiles with acceleration levels. Some subjects had judgment problems while matching the two types of vibrations. Both experiments showed no significant differences between the transverse modes. Subjective response indicated that the higher FDP levels produced very uncomfortable sensations, which suggests that mere exposure to such high level vibrations may induce fatigue in many subjects. Any additional involvement in performance tasks demanding skill and vigilance throughout the exposure duration considered in this study may impose additional stress and accelerate the fatiguing process in subjects much earlier than expected.

by R. K. N. Rao; B. Jones

Publ: Ergonomics v21 n2 p123-34 (Feb 1978)
1978, 17 refs

Sponsored by Science Res. Council (U.K.). Summaries in French and German.

Availability: See publication

car driver. The method employs a car equipped with a video-recorder, of which the camera is mounted behind the windshield, continuously recording the independent variable of traffic load. Dependent variables are physiological indices, such as muscle tension, heart rate (HR), heart rate variability (HRV), galvanic skin response (GSR), respiration rate, etc., and performance on a secondary task (Interval Production Test (IPT), involving driver tapping regularity). A review of the factors in the preparatory phase of the experiments is presented. This type of system will enable one to draw a "mental load map" of a town, which could be used by municipalities to avoid difficult areas, or could be employed by public authorities for traffic system improvement.

by C. Wildermark; G. Mulder; J. A. Michon
 Publ: *Ergonomics* v21 n3 p225-9 (Mar 1978)
 1978; 15refs
 Includes French and German summaries.
 Availability: See publication

HS-023 987

A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING

Indirect psychological or physiological measures of driving performance are often used without supporting evidence, or even comment, on their validity. In this validation the performance of ten subjects on a subsidiary reaction time (RT) task and a visual detection task was correlated. On the RT task, 91 dB auditory signals were presented with an average interstimulus interval of 50 sec. On the detection task, the subjects had to brake as fast as possible when they perceived a 40 x 40 cm obstacle at the side of the road. Over the three-hour test in night driving conditions on a closed 5-km track, the correlation between group averages was -0.78 and the average within-subject correlation was -0.47. From these results, and a discussion of the predictive and the construct validity of the RT task, it is concluded that subsidiary RT may be used as a valid indicator of changes in efficiency of driving performance.

by H. Laurell; H.-O. Lister
 Publ: *Ergonomics* v21 n2 p81-8 (Feb 1978)
 1978; 20refs
 Sponsored by Transport Res. Delegation (Sweden). Includes French and German summaries.
 Availability: See publication

HS-023 988

FUTURE FLASH [CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE]

A world shortage of fossil fuels, an activist Federal government, and an unprecedented upward price spiral have forced the American automobile industry to commit over \$35 billion to change, resulting in an automobile revolution of the late 1970's and early 1980's. A world shortage of fossil fuels has an almost one-to-one correlation with the shape and size of cars. The best ways to increase fuel mileage are to reduce weights, improve transmissions, and investigate more efficient power sources. Federal government regulation of the automobile means that change must meet a rigid schedule under penalty of huge fines. A radical change in improving automotive fuel economy must come about in six years. A world economy

marked by stagflation requires that innovative materials and solutions be found or the penalty will be loss of profits. The car of the next decade will be small, safe, efficient, fun to drive, will remain in tune for long periods of time, will not change in shape or appearance for years, and will be able to serve many needs in many parts of the world. The cars of the 1980's will be efficient enough to offer agility, performance, and economy. SRI International (formerly Stanford Res. Inst.) suggests some available alternatives to meet emission and fuel economy goals: electronic ignition control, high-energy long-duration ignition spark discharge, electronically controlled fuel injection, exhaust gas sensor control of air/fuel ratio, electronically controlled or "snic flow" carburetor (probably variable venturi), quick warm-up systems, exhaust gas recirculation, lean mixture operation, Eaton valve selector (deactivation of one or more cylinders), and such stratified charge concepts as separate prechambers, direct injection, and valved or unvalved prechamber.

by Leon Mandel
 Publ: *Motor Trend* v30 n9 p56-8, 80 (Sep 1978)
 1978; 2refs
 Availability: See publication

HS-023 989

IS THERE A PLACE FOR THE SIMULATOR IN DRIVER LICENSING? [NEW YORK STUDY]

In an effort to improve its driver licensing program, the New York State Dept. of Motor Vehicles investigated the feasibility of the partial automation of the license testing process by use of the driving simulator. At issue was whether a driving simulator could provide valid measurements of the competency required by the novice driver to operate successfully in the highly variable driving environment (competency needed before the road test is attempted), and the minimum competency that a licensed driver should demonstrate in the license renewal process. The study demonstrated that a driving simulator examination can discriminate between groups of drivers on the basis of driving proficiency. The examination was most efficient in discriminating between drivers with wide differences in proficiency, i.e. the professionals vs. the novice drivers. Professional drivers also showed superiority over non-professionals with driving experience. The most efficient discriminators between experienced and inexperienced drivers were brake and sudden emergency maneuver questions. Drivers who received their licenses within seven months after the simulator exam achieved significantly higher simulator scores than those not receiving driver licenses. The simulator test was unable to discriminate between groups of drivers based upon their previous motor vehicle accident and conviction records. The driving simulator can be greatly improved in performance by providing the examinee with more information on the status of his/her vehicle controls in order to compensate for the lack of control feedback normally available from the highway. The driving simulator is especially useful in testing situations that would be too dangerous to attempt on the highways. With technical improvements in steering mechanism and refined methods of driving scene presentation, the simulator can assume a major role in driver testing.

by John F. O'Brien
 Publ: *Traffic Safety* v78 n8 p8-10, 34-5 (Aug 1978)
 1978
 Sponsored by National Hwy. Traffic Safety Administration.
 Availability: See publication

HS-023 990

HOW THE TRUCKING INDUSTRY IS PROMOTING THE 55 M.P.H. SPEED LIMIT

Since Jan 1974, when the government first lowered the national speed limit to 55 mph, the trucking industry, through American Trucking Associations, Inc. (ATA) and its affiliated state associations, has made a concerted effort to promote compliance with the Federal law. Technological improvements in truck and engine designs plus strict enforcement of a maximum of 55 mph have brought about fuel savings as high as 20% to 25% for many truck companies. This represents a financial benefit to the industry. Current approaches by ATA and state associations to promote compliance with the speed limit include the use of the industry's cooperative road program (CRP). Organized in 1951, the CRP uses safety patrolmen to monitor truck operations. The Safety Monitor program of the California Trucking Assoc. (CTA), operating since Apr 1977, involves 1200 participants who observe the driving habits of all heavy trucks, especially those registered in California, and submit reports of speeding or unsafe driving practices to the CTA. In Jan 1978, the Minnesota Motor Transport Assoc. (MMTA) launched an intensive campaign to promote industry and public awareness of the need to comply with the 55 mph speed limit. The Idaho Motor Transport Assoc.'s Council of Safety Supervisors operates a fleet of four radar units on the state's highways to check on truck speeds; positive as well as negative reports are submitted by the supervisors. The Missouri Bus and Truck Assoc. (MBTA) developed an extensive program to stop speeding, including the distribution of special forms to motorists to inform the public of the industry's compliance efforts. State trucking associations in Illinois, Maryland, and Indiana have also organized road monitoring programs. In addition to its road patrol program, the Indiana Motor Truck Assoc. (IMTA) has urged trucking management to actively support driver education programs, and to alter routes and schedules to eliminate the need for speeding. The Oregon Trucking Assoc.'s Council of Safety Supervisors and the Oregon chapter of the National Assoc. of Fleet Supervisors sponsored a three-day Safety Blitz to monitor truck traffic and to clock speeds. Other measures taken by many other ATA-affiliated associations include passing resolutions in support of the speed limit, urging members to obey the limit through articles in their publications or by publicity through the news media, and registering support of speed limit enforcement programs to state government and safety officials. The ATA recently endorsed the use of Federal Hwy. Trust Fund monies to help enforce the 55 mph speed limit.

by Allison Kaplan
Publ: Traffic Safety v78 n8 p22-4 (Aug 1978)
1978

Availability: See publication

HS-023 991

WHY MOTORCYCLE DEATHS ARE SOARING

Safety experts, specifically the National Hwy. Traffic Safety Administration (NHTSA), are blaming the 1976 Congressional action which forbade the Dept. of Transportation (DOT) to withhold highway funds from states without mandatory motorcycle helmet laws, for the rising toll of motorcycling deaths in the U.S. Since that time, over half of the 50 states have repealed their helmet laws. The repeal movement's impact on human lives is becoming clear. Motorcyclist deaths jumped 23% in 1977, although the number of cycles rose by only 1%. Ac-

cidents killed 4082 cyclists in 1977, most of them young males. Until the wave of repeals began in 1976, the rate of deaths per 10,000 registered motorcycles had been declining for a decade; now that rate is on the rise again. Fatalities in 1977 in the 14 states that repealed their laws during the year increased 41%, compared with 21% in states that retained their helmet statutes. In the 15 states without helmet laws that report whether cyclists involved in accidents were wearing helmets, deaths of helmeted cyclists decreased 20% between 1975 and 1977, but deaths of unhelmeted cyclists rose 169% in the same period. It has been determined that helmet usage among cyclists falls sharply when mandatory laws are stricken. Researchers in Kansas found that fewer than 1/10 of the motorcyclists continued to wear helmets in urban areas after that state repealed its law in 1976. In the first year after repeal, traumatic head injuries rose 70% in Kansas cities. Cyclists without helmets sustained head injuries 56% more serious than those with helmets. Information about the value of helmets in saving lives was available to Congress in 1975 and 1976 when it ended NHTSA's authority to withhold highway funds from the states, but testimony on the helmet issue before the House Surface Transportation Subcom. was almost entirely dominated by motorcycle groups opposed to mandatory use of helmets (e.g. American Motorcyclist Assoc. and ABATE (A Brotherhood Against Totalitarian Enforcements)). Joan Claybrook, head of NHTSA, believes Congress acted irresponsibly and that the whole episode is a classic example of how single-minded pressure groups can work their will on Congress.

Publ: U.S. News and World Report v85 n9 p35-6 (4 Sep 1978)
1978
Availability: See publication

HS-023 992

CHOOSING AND CARING FOR STORAGE BATTERIES

Some practical working knowledge of automotive storage batteries, and the differences among batteries, is presented in an effort to aid the consumer in selecting a new battery, or in taking care of an existing one. The subject is covered in sections dealing with battery construction, real and warranted life, battery ratings, care, and safety. New battery construction includes plastic cases which allow thinner walls and more active materials inside. Lack of proper maintenance is a common cause of battery failure, as are overcharging, undercharging, lack of water or the wrong kind of water, and physical abuse. For maximum battery life, the battery should be clamped firmly but not too tightly in place, and the top, cable ends and surrounding hardware should be kept free of corrosion by washing with baking soda and water. "Maintenance-free" batteries use calcium and tin alloyed with lead instead of antimony, which reduces loss of water. These batteries have less tendency to self discharge, better resistance to frost and to acid residue, and are usually lighter in weight than conventional batteries. They are more expensive, however, and are less able to recover from a cycle of "deep discharge" and recharge. Some batteries, intermediate between conventional and "maintenance-free" types, have a lower proportion of antimony in the grids. Dangers associated with batteries include corrosive acid (in case of spillage), and an explosive mixture of hydrogen and oxygen when charging, particularly with misapplication of jumper cables.

Publ: Consumers' Research Magazine v61 n9 p33-6 (Sep 1978)
1978

HEIGHTEENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE [U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES]

Representative sample surveys of American households conducted in mid 1978 provided further evidence of a sustained downturn in consumer spending. The Index of Consumer Sentiment was 88.0 in the Jun 1978 survey, down from 82.5 in May, although slightly above the low of 78.8 recorded in Mar 1978. The June index stands just 7 index-points above the May 1975 reading of 72.9 which signified the reestablishment of consumer confidence following the 1974-1975 recession low point. Although a majority of U.S. consumers do not expect business conditions to change significantly during the next 12 months, nearly a majority characterize the prospect of an unchanged economy as meaning "bad times financially". Rising concerns with interest rates, unemployment, and prices have each contributed significantly to the establishment of less favorable expectations. Despite this growing concern and even fear of recession, income and employment gains have thus far helped to insulate consumers, and favorable personal finances have played a pivotal role between increasingly pessimistic business expectations and favorable buying attitudes. Heightened concern over inflation, together with declining confidence in government economic policy, has led consumers to be more pessimistic about long-term business prospects and, because of buy-in-advance price motivations, to view current buying conditions more favorably. Buy-in-advance motives are now at an all-time peak level, and have acted to forestall sharp declines in consumer spending. In June, favorable opinions of market conditions were held by the majority; 66% felt it was a good time to buy household durables, 51% viewed buying conditions for cars favorably; and 58% felt market conditions for houses were good. Among all respondents, 39% cited buy-in-advance reasoning when explaining why they felt it was a good time to buy cars, up from 33% in May. The June survey indicates that consumer spending on durables will be maintained at or near current levels in the near term. The recent slowdown in real consumption spending is expected to continue as the rate of personal saving increases throughout the balance of 1978. While the likelihood of a sudden collapse in consumer spending is very small, it cannot be discounted. Inflation threatens to end the crucial facilitating role played by personal financial attitudes, as well as to prompt consumers to reevaluate buy-in-advance price rationales. Survey data charts are attached.

by Richard T. Curtin
University of Michigan, Survey Res. Center, P.O. Box 1248,
Ann Arbor, Mich. 48106
1978: 14p

Presented at 1978 Management Briefing Seminars, Automotive Trends and Directions, 9 Aug 1978. To appear in Economic Outlook USA v5 n3 (Summer 1978).
Availability: Corporate author

HS-023 994

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS [MOST RECENT ROTARY ENGINE DESIGNS]

The most recent rotary engine designs exhibit durability, emission control, and fuel economy characteristics comparable to those of conventional powerplants, and untapped potentials

are currently being discovered. Toyo Kogyo engineers have been refining their Mazda rotary each year. In its latest production form, this two-rotor powerplant features improved combustion sealing, dual ignition with selective firing of its trailing plugs, an optimized rotor pocket, and thermal reaction enhanced by exhaust port liners. Toyo Kogyo's advance program includes one design with crankshaft-induction lean combustion and another with direct-injection stratified charge. Audi NSU's efforts have been directed toward a rotary option for its 100 sedan (in North American markets, the 5-cylinder version of this car is known as the Audi 5000). Technical features of the two-rotor engine under development include dual-intake side ports, thermostatically-controlled oil cooling of the rotors, and fuel-injected lean combustion. Other rotary developments include Curtiss-Wright's direct-injection stratified-charge engine with multi-fuel capabilities and a potential for diesel-like economy, and Ingersoll-Rand's rotary, which runs on natural gas and delivers 400 kW (550 hp) per rotor. Outboard Marine continues development of single- and multi-rotor engines for possible outboard applications. Toyota has shown a carbureted, dual-inducted, stratified-charge design that is said to offer 9% to 11% better fuel economy than a reciprocating counterpart.

Publ: Automotive Engineering v86 n2 p31-42 (Feb 1978)
1978

Based on SAE-78041 "Development on Exhaust Emissions and Fuel Economy of the Rotary Engine at Toyo Kogyo," by Keiichi Yamamoto and Takami Muroki; and SAE-78041R "An Update of the Development on the New Audi NSU Rotary Engine Generation," by Richard van Busshoven and Gottlieb Wilms. Both papers were presented at SAE Congress, Detroit, 27 Feb-3 Mar 1978.
Availability: See publication

HS-023 995

POLICE LEARN DRIVING SKILLS AT LOW SPEEDS

For two years the National Acad. for Police Driving (NAPD) in Lancaster, Tex., has been offering an intensive three-day course designed to acquaint police officers with the handling and maneuvering of their vehicles under the most demanding conditions in order to assure proper use of the vehicles in all phases of police work. The program consists of eight hours of classroom instruction and 16 hours of actual driving experience. Classroom instruction includes mental and physical factors in pursuit, reaction to forces on a moving vehicle, accident avoidance and crash procedures, radio usage, vehicle identification systems, and proper post-crash procedures. A more extensive 40-hour course, an 80-hour instructor course, and a 12-hour refresher course are also offered. All courses are offered at both the home site south of Dallas, which is equipped with a track layout designed for the application of the driving theories, and at a mobile school, which can travel to the home location of a police department. The training methods and the driving exercises are the same at the mobile school as at the home site, except that the track layout configuration must suit local conditions. In addition to the police training course, courses are offered for emergency vehicle drivers, private security service drivers, professional chauffeurs, fleet drivers, and others whose work demands top-notch driving ability.

by Richard H. Turner
Publ: Traffic Safety v78 n7 p12-4, 29-31 (Jul 1978)
1978
Availability: See publication

HS-023 996

DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)

Industry forecasters all agree that it is only a matter of time before Class 6 (medium-duty) trucks will be diesel-powered, joining the ranks of the heavy-duty Class 8 truck market (virtually 100% diesel) and the Class 7 truck market (2/3 diesel). So far in 1978, 11% of medium-duty trucks sold in the U.S. are diesel-powered (compared to 10.2% for 1977 and 2% for 1974). The industry's leading producer of mid-range diesel engines, Caterpillar, believes that these powerplants will become serious contenders for the Class 6 market by the middle of the next decade. Expectations are that these powerplants will swell to 240,000 units by 1980 and 280,000 by 1985; this would represent a 50% dieselization of Class 6 vehicles in 1985. Foreign manufacturers also see an optimistic future for diesels in the U.S. Class 6 market. Among the foreign manufacturers preparing to enter this market are Iveco (a consortium of five European manufacturers headed by Fiat), Mercedes-Benz, Volvo, and Japan's Isuzu Motors, Ltd. Domestic manufacturers stepping up Class 6 diesel engine production include International Harvester, Cummins (for Ford Motor Co.), Caterpillar, and General Motors' Detroit Diesel Allison.

by John A. Stark

Publ: Automotive Industries, T and OH, v158 n12 p51-4 (Aug 1978)

1978

Availability: See publication

HS-023 997

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT (HARVESTING MACHINE, FORKLIFT TRUCK)

The sources of hydraulic noise in two off-highway vehicles and ways to minimize it were examined. Equipment tested included a harvesting machine and a rough-terrain forklift truck used by the military. The noise-control efforts for this equipment have impact on clean-sheet designs as well as retrofit packages. In the harvesting machine, the principal offending component was the hydraulic piston pump, which was isolated by a resilient mounting system. In the military forklift truck, noise sources included numerous actuating cylinders, a common reservoir behind the operator's seat, and three separate nine-tooth gear pumps. The vehicle had no operator cab or other noise barrier. Initial noise control measures included remote discharge of exhaust gas from the test site, remote supply of intake air, sealing of all holes in the vehicle, and lining of the body interior with sound absorbing material. The hydraulic system was identified as a primary source of noise, particularly the top surface of the hydraulic reservoir. Relocation of the Roots blower housing improved the situation. Other modifications included replacement of rigid hydraulic lines with flexible hose, isolation of main hydraulic valve bodies from panels, and isolation of the hydraulic reservoir. Replacement of the steering pump with one of another type was considered desirable. Other changes were made to vehicle body, engine intake, exhaust, and cooling systems, and an L-shaped noise shield was fitted to the right and rear of the driver position. Total noise at this position was reduced from 101 dBA to 86 dBA. Further noise reduction (to 78 dBA overall) was ef-

fectly by installation of an operator cab. Remaining noise was attributed to tooth frequency of the gear pumps.

Publ: Automotive Engineering v86 n9 p34-40 (Sep 1978)

1978

Based on SAE-780757 "Practical Methods for Reducing Hydraulic Noise," by G. E. Maroney and J. D. Harris; SAE-780758 "Control of Hydraulic System Noise in a Military Vehicle," by Robert N. Baker; and SAE-780759 "Mechanical Isolation of Hydraulic Noise Sources," by Stanley J. Skafitis. Availability: See publication

HS-023 998

OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT TO PREDICT (LARGE MINING TRUCKS)

In view of the evolution of new and more stringent codes in Canada for the braking performance of off-highway, open-pit mining trucks, a series of actual truck performance tests was conducted to learn whether stopping performance was predictable, to determine fade characteristics of available linings, and to compare actual with theoretical brake performance under various conditions. Tests were carried out with a 170-ton WABCO haulpak truck equipped with Rockwell Sumpmaster shoe brakes. A series of stops at maximum brake operating pressures were run on level, 6%, and 10% grades, under empty, half-loaded, and fully-loaded conditions. Two different lining mixes were studied. The truck was driven by General Electric 776 electric wheel motors having a 28.8:1 armature to wheel ratio. It used 36.00:51 E-3 tires, 36 x 12 R4H front drum, and 36 x 14 R4H rear drum brakes. From the results of this series of tests, it may be said that designing a brake system and selecting a brake on the basis of the static torque or the static K value is inadequate. Both test linings exhibited a truck K value of 0.31 but did not work equally well. It was found that a level equivalency test of stops on a 10% grade is impractical. Both brake systems performed similarly on level ground, yet quite differently on a 10% grade. Doubling the GVW (gross vehicle weight) to double the energy of the level stop is impractical because of tire loading limitations. Increasing speed is impractical because of drivetrain limitations. Towing is impractical because of the design of the tow bar and its attachments, and some of these actually duplicates the true energy input to the braking systems. If a lining is selected to be equivalent to one already successful, it must be tested on grades and at expected operating speeds. There is no guarantee that two linings of equivalent or different friction ratings will behave the same or differently. Linings are available which can yield good repeatable and predictable performance when used with drum-type brakes. Mathematical relationships are applicable with these linings.

Publ: Automotive Engineering v86 n9 p58-62 (Sep 1978)

1978; 1ref

Based on SAE-780777 "Brake Testing and Lining Evaluation of Large Off Highway Mining Trucks," by Donald R. Thomas. Availability: See publication

HS-023 999

DIESEL PISTON TEMPERATURES MEASURED

Techniques used to measure diesel piston temperatures, and

coefficient) method. Factors influencing piston temperature with significant differences between uncooled and oil-cooled pistons include the effects of ring-groove insert and of top land clearance. Oil-jet-cooled piston studies are reported which investigated using the NTC method, the effect of the cooling method on piston temperature, effect of oil flow rate on piston temperature, and effect of oil temperature and mean effective pressure. Forced-oil-cooled piston studies are reported which investigated the effect of compression ratio (fusible plug method), effect of cooling channel location (NTC method), effect of flow rate (NTC method), effect of oil supply or drain hole diameter (NTC method), effect of sheet metal cooling channel (NTC method), and effect of composite piston (fusible plug method).

Publ: Automotive Engineering v86 n9 p64-72 (Sep 1978)
1978
Based on SAE-780781 "Thermal Effects on Diesel Engine Pistons," by Manfred D. Rohrich.
Availability: See publication

HS-024 000

SPECIAL STEEL EXTENDS BEARING LIFE

Tapered roller bearings made of consumable electrode vacuum arc remelted (CEVM) steel have exhibited, in both laboratory and the "real world", superior contact fatigue strength over bearings of conventional vacuum-degassed steel. The improved fatigue strength offers all the advantages of an equivalent increase in application rating without altering the bearing envelope, i.e. more fatigue strength is provided in the same or less space. Since any size bearing can be made from this material, the automotive industry as well as others may reap the benefits. Whether for new or upgraded machines, the CEVM option offers potential performance, mounting, and economic benefits. Both the steel and bearings made from it require special production facilities and processing, with higher costs than their conventional counterparts, but the life/cost ratio is greater. Design, tooling requirements, and performance trade-offs can economically favor the CEVM bearing approach. CEVM steel contains fewer and smaller non-metallic inclusions than conventional bearing steels, thereby reducing one form of fatigue failure. Where modes of fatigue failure other than "inclusion origin" predominate, full benefit of a premium steel bearing may be unobtainable. Evaluation of bearings' total environment to determine expected fatigue mode requires knowledge of operating loads, speeds, lubricant, temperatures, and alignment, and use of a sophisticated computer program. Bearings made of CEVM steel are generally modified by contouring, roller-race contact, etc. to realize maximum performance. Among the potential advantages of these high-performance bearings are greater capacity per dollar in most bearing sizes, lower mounting cost due to reduced shaft and housing size, lower torque and heat generation, lower weight bearing assembly and mounting components, lower rib and roller velocities at given rpm, lower centrifugal force effects at high rpm, higher speed at the same operating temperature, and lower oil flow requirement at the same speed and operating temperature. In locations where these conditions are critical, high performance bearings may prove cost-effective.

Publ: Automotive Engineering v86 n9 p74-82 (Sep 1978)
1978
Based on SAE-780784, "High Performance Bearings," by R. L. Widner, W. K. Dornick, and A. J. Jenkins, Timken Co.
Availability: See publication

MAZDA'S NEW 7-WAY SYSTEM NEEDS NO AIR/FUEL FEEDBACK

Toyoto Kogyo engineers have combined EGR (exhaust gas recirculation) and three-way catalysis into a system meeting Japan's final emission standards, yet this Stabilized Combustion System (SCS) requires no elaborate feedback control of air-fuel ratio (A/F). Key to SCS is a balancing of NOx (nitrogen oxides) control strategies, brought about by varying A/F inherently as a function of dual-port EGR flow. This is accomplished via a carburetor air bypass linked to an above-throttle EGR port. Under heavy-load conditions generating additional NOx, the system provides fuel enrichment along with its increased EGR. This translates into enhanced drivability and a reducing atmosphere downstream beneficial to NOx catalysis. Yet during light-load operation, the result is a lean A/F mixture, only moderate EGR via a lower port in the intake manifold, and an oxidizing atmosphere for catalytic control of HC (hydrocarbon) and CO (carbon monoxide). All this is achieved without need (or complexity) of oxygen sensing, fuel injection, or electronic fuel trim. Toyoto Kogyo's SCS-equipped Mazda vehicles meet Japan's 1978 emission standards for the 10-mode urban cycle which are comparable to original statutory limits in the U.S.: HC, CO, and NOx limits of 0.25 g/km, 2.1 g/km, and 0.25 g/km, respectively. These figures convert to approximately 0.4 g/mi, 3.4 g/mi, and 0.4 g/mi, respectively, although the driving cycle is different from that used in the U.S. There is also an 11-mode procedure, an 8-min test with somewhat higher speeds than those of the 10-mode cycle and limits of 7.0 g/est, 60 g/est, and 4.4 g/est for HC, CO, and NOx, respectively. Results of 10- and 11-mode driving cycle tests indicate that SCS-equipped vehicles give better fuel economy than that obtained from comparable vehicles with uncontrolled emissions. Very little deterioration of emission values was observed after 105,000 km of driving.

Publ: Automotive Engineering v86 n9 p84-8 (Sep 1978)
1978; 1ref
Based on "Stabilized Combustion System (SCS)-Mazda Emission Control System for Reciprocating Engine," by Hiroshi Ikeda, Toyoto Kogyo Co., Ltd.
Availability: See publication

HS-024 602

BONDED BUS SNAPS TOGETHER

Built by Flexible Bus Co. (when owned by Rohr Co.) the #70 transit bus is a product of several design and construction innovations not found on previous generations of buses. These innovations include a reduction in the number of fasteners from 16,000 to 4000, replacement of conventional flat steel and aluminum sheet by multifunction aluminum extrusions and fiberglass panels, and extensive use of structural adhesives both to join sections and to form sandwich panels. The conventional method of manufacturing a bus has been replaced by a technique that uses four assembly lines to build the coach body, complete roof, floor, and each side wall are assembled on separate lines. The four bus sections are literally snapped together. Each mating edge is joined by the patented extrusion lock, in which interlocking extrusion edges are held in place by an adhesive. Once the box-like structure is assembled, air conditioning and engine modules are slipped into the back end. Fiberglass front and rear modules complete the body. At a separate location, undercarriage modules consisting of the

front end, rear end, and fuselage have been assembled. When the modules are mated with the body and bolted in place, the bus is essentially complete. Builders of the Flexible 870 have tried to deter vandals by eliminating all exposed fasteners, placing removable items such as speakers and lighting fixtures in recesses, and using a hard-surface paint. The 870 goes part way toward providing easy access for the elderly and handicapped. The front air-bag suspension of the bus can be inflated and deflated by the driver, causing the height of the front step to be lowered from 14 in to 8 in above the ground. The bus aisles and door opening are wide enough to accommodate a standard wheelchair. As an \$8000 option, the bus can be fitted with a hydraulic lift in the front stairwell. To simplify maintenance, the key elements of the steering gear, drivetrain, and engine can be changed by removing a few critical bolts. The 870 bus currently sells for between \$90,000 and \$110,000, depending on options and vehicle size.

by Robert B. Amnson

Publ: Machine Design v50 n20 p28-30 (7 Sep 1978)
1978

Availability: See publication

HS-024 003

LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS [WEIGHT SAVINGS IN AUTOMOBILE PARTS]

Automobile manufacturers are evaluating glass bubble-filled SMC (sheet-molding compound) and BMC (bulk-molding compound) parts for weight savings in plastic automobile parts. Current development programs are aimed at reducing plastic-part weight by about 30% with an 8% mix of high-strength glass bubbles in plastic, using specially-formulated additives to bind the bubbles securely in order to prevent surface pitting during sanding. The two major advantages of filling plastics with hollow glass microspheres are the weight savings and cost reduction gained by displacing heavier, costlier resin. The cost of glass bubbles based on the volume of resin displaced is less than most other fillers and glass bubbles do not absorb resin as porous fillers do. Specific tensile and flexural strength, stiffness, impact resistance, thermal insulation, dielectric properties, moldability, and machinability of the glass-resin composites are superior to those of unfilled resins. Bubble-filled plastic parts are being used in Ford and General Motors test models.

by John K. Krause

Publ: Machine Design v50 n20 p90-3 (7 Sep 1978)
1978

Availability: See publication

HS-024 004

LIFE IN THE FAST LANE [FREEWAY DRIVING]

Pointers are presented for safe driving on freeways: preplanning or familiarity with the route, matching speed to traffic flow while in the acceleration lane (if provided), and finding a space to merge into the traffic flow. Also recommended are use of turn signals on exiting the freeway, avoidance of combined deceleration/acceleration lanes, and selection of the lane providing the most space and fewest problems (usually the center lanes). Other advice includes not tailgating, watching for quick movements by other cars, maintaining steady speed, use of turn signals when changing lanes

and cancelling afterward, and checking for blind spots. Deceleration on off-ramps and full attention to driving when on the freeway are also emphasized.

Publ: Driver v12 n3 p1, 3-8 (Aug 1978)

1978

Availability: See publication

HS-024 005

MOTORCYCLE ACCIDENT FATALITIES

Statistical data are presented on fatal motorcycle accidents (including the motor scooter and the motorized bicycle) in the U.S. Between 1966 and 1976, motorcycle registrations rose from 1,753,178 to 4,989,232, although the rate of increase has slowed considerably since 1974. There were 3000 fatalities among motorcycle operators and their passengers in 1976, about 50% more than the 2043 motorcycle accident deaths in 1966. The fatality rates based on registrations declined from 116.5 per 100,000 registered motorcycles in 1966 to 60.1 per 100,000 in 1976, but were nevertheless between 2 and 2.7 times higher than the fatality rates among occupants of all other types of motor vehicles. When measured in terms of the number of miles driven, the hazards of motorcycling are even more pronounced. According to National Safety Council estimates, the death rate for motorcycle riders was about 13 deaths per 100 million miles in 1976, compared with a rate of 3.3 for drivers, passengers, and pedestrians in all other motor vehicle accidents. Reflecting the strong appeal of motorcycles to younger people, nearly 80% of motorcycle accident fatalities occur among motorcyclists under 30 years of age. More than 90% of all the fatalities are among males. There is no doubt that inexperience and lack of skill are contributing factors to the relatively higher fatality rates among motorcyclists. The operator needs adequate instruction and training in acquiring the skills for safe operation of the vehicle. Collisions with other motor vehicles are responsible for at least two out of three fatalities among motorcyclists. Motorcyclists are particularly vulnerable to serious injury or death in a collision because their vehicles offer no structural protection. To counteract their low visibility due to the small size of the vehicle, motorcyclists should wear brightly colored clothing and reflective strips, and should use headlights at all times. The number of fatal or serious head injuries is significantly reduced when properly constructed and fitted protective headgear is worn. Motorcycle licensing procedures have also helped to reduce the number of fatalities and injuries.

Publ: Metropolitan Life Insurance Company Statistical Bulletin v59 n2 p7-9 (Apr-Jun 1978)

1978; 7cdfs

Availability: See publication

HS-024 006

NEW PROCESS MAKES GASOLINE FROM ALCOHOL

The key to Mobil's process for converting methanol (or ethanol) to gasoline is the company's discovery of a catalyst, a unique zeolite called ZSM-5. Zeolites are porous crystalline substances made up of silicon, oxygen, and aluminum. ZSM-5 converts methanol primarily into gasoline (rather than other hydrocarbons) because of the size of its pores. A molecule the size of methanol (very small, with only one carbon atom) can enter the pore system, and molecules within the gasoline

ranges (with three to ten carbon atoms) are able to get out. Since molecules with more carbon atoms cannot be accommodated by the pore system, they are never formed. The final product of the conversion process is about 85% high-octane gasoline, 13.6% LPG (liquefied petroleum gas), and 1.4% useful light fuel gases. The rationale behind conversion of methanol to gasoline is the low Btu content of methanol, impairment of drivability of cars, corroding of fuel system parts, and separation of methanol from a methanol/gasoline mix in the presence of small amounts of water. Extraction of methanol from other than petroleum sources is not cost-effective, but could become so.

by V. Elaine Smay
Publ: Popular Science v212 n6 p90-1 (Jan 1978)
1978; 4ref
Availability: See publication

HS-024 007

ANALYSIS AND DESIGN OF THREADED ASSEMBLIES [MECHANICAL FASTENERS]

As the result of a concerted research effort sponsored by the International Standards Organization (ISO) to develop sound technical procedures for the design and evaluation of fastener product standards, a model to precisely predict the load and mode of failure of threaded assemblies has been developed. Three possible failure modes of a fastener assembly due to static tensile overload are bolt breaking, bolt thread stripping, and internal thread stripping. The most significant factors affecting static strength of a threaded assembly include geometric or dimensional factors, ultimate strength of external and internal thread material, ratio of shear strength to tensile strength, nut dilation, relative strength of nut to bolt threads, coefficient of friction, effect of applied torque, and number of threads in the grip. The analysis is applicable to any assembly of the ISO R68 or Unified thread form, of which pertinent dimensional and mechanical properties are known. These techniques have been extended to provide a method for design of assemblies, and appropriate testing standards for the product. Using equations and a computer program, strength design (nut height) for any non-standard fastener assembly of the ISO R68 or Unified thread profile may be computed. (With slight modification to the tensile stress area calculation, the program can also be used for the "J" profile.) Although the design approach is restricted to fasteners in the size 5 mm through 36 mm, certain of the strength prediction equations are applicable to other sizes and can be used to determine fastener strength. In the event that a non-standard assembly is to be designed and a computer is not available to the designer, a simplified approach for determining a reasonable approximation of nut height is suggested.

by B. M. Alexander
Steel Co. of Canada, Ltd.
Rept. No. SAE-770420; 1977; 18p 7ref
Presented at International Automotive Engineering Congress and Exposition, Detroit, 28 Feb-4 Mar 1977.
Availability: SAE

HS-024 008

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (I3EH)

PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1

A compilation of papers presents the concerns of the world energy community and identifies the current centers of energy conversion activity and engineering applications. The following topics and subtopics are covered: aerospace power (space power requirements and conditioning topology, synchronous orbit power systems, energy storage systems and solar cell developments for space, advanced lightweight solar arrays, space power-satellite power systems, solar power satellites, nuclear reactors-aerospace applications); alternate fuels; biomedical power; Brayton cycle; coal, shale, and tar sands (oil, gas, and shale technology, in situ coal conversion, coal liquefaction and gasification in large plants, coal conversion process - large plants and new concepts, new concepts in coal conversion, fluid bed combustion and its application to coal conversion technology, coal conversion and combustion technology); electric propulsion; electrochemical power (ambient-temperature batteries, high-temperature batteries, fuel cells and metal/air batteries); and energy conservation (buildings, industrial and marine systems, community energy systems).

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15095
Rept. No. SAE-P-75-Vol-1; IHS-78-CH1372-2-ENERGY-Vol-1; 1978; 923p refs
Includes IHS-024 009--IHS-024 017, Vol. 2 is HS-024 018; Vol. 3 is HS-024 024.
Availability: SAE

IHS-024 009

THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION

A 1977 picture of alcohol-fuels utilization technology readiness in anticipation of future demand is provided. When the last comprehensive assessments in the U.S. of alcohol-based automotive fuels were made in late 1974, a number of problems were identified which were expected to impede the implementation of alcohol fuels in the highway sector. These problems included the following: lack of data on multi-cylinder engine systems optimized for alcohol fuels; particularly, neat methanol; need for examination of the trade-offs among higher compression ratios, ignition scheduling, NOx (nitrogen oxides) emissions, and exhaust gas recirculation (EGR); lack of widely consistent data on fuel economy and exhaust emissions; little experimental evidence to characterize the magnitudes of predicted water-induced blend phase separation and hot-fuel handling problems, particularly in fleet service; little reliable data on the engine wear, lubrication, and corrosion effects of alcohol fuels; and general deficiency of information on low-level methanol exposure and alcohol-fuels environmental impacts in general. Research and development in alcohol-fuels utilization since 1974 has expanded markedly. Those developments that have directly addressed the perceived gaps and deficiencies in the 1974 data base are highlighted, with methanol (and methanol/gasoline blends) and ethanol (and ethanol/gasoline blends) considered separately. Topics discussed include exhaust emissions, performance and fuel economy, vehicle drivability, engine/vehicle design changes, fuels characteriza-

tion, and other environmental, health, and safety considerations.

by R. Eugene Ecklund; Andrew J. Parker, Jr.; Thomas J. Timbacio; Peter W. McCallum
Department of Energy, Washington, D.C.; Mueller Associates, Inc., Baltimore, Md.
Publ: HS-024 008 (SAE-P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 1," Warrendale, Pa., 1978 p226-32
Rept. No. SAE-789052; 1978; 37refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 010

USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA

The owners and operators of almost one-third of the approximately 3000 on-road electric passenger cars and delivery vans presently used in the U.S. and Canada were surveyed in an attempt to determine the suitability of commercially sold electric vehicles (EV's) for real on-road jobs. An analysis is presented of the engineering aspects of the user experience with EV's, i.e. mileage and application, failure modes and rates, energy economy, maintenance requirements, life cycle costs, and vehicle performance characteristics. It is concluded that existing EV's can perform satisfactorily in applications that have limited performance requirements, particularly in terms of range. It is also concluded that the EV's manufactured in the U.S. exhibit excessive failure rates characteristic of vehicles which have not reached production maturity and that support organizations of these vehicles have not attained sufficient maturity either.

by Jeel J. Sandberg; Kian Leschly
California Inst. of Tech., Jet Propulsion Lab., Pasadena, Calif. 91103
Publ: HS-024 008 (SAE-P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 1," Warrendale, Pa., 1978 p644-54
Rept. No. SAE-789391; 1978; 6refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 011

A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC-VEHICLE PERFORMANCE DATA

Published electric-vehicle (EV) performance data were successfully correlated with "naturally-occurring" parameters that emerged from a vehicle mass and energy balance analysis. Since the gravimetric-energy content of batteries is less than 1/100 that of petroleum, the EV mass fraction dedicated to energy storage must be much greater than that of petroleum-fueled vehicles. Thus, EV's must be built to value range at the (necessary) expense of competing values (e.g. energy utilization, crashworthiness). Data from 68 EV's were plotted to show that increasing battery mass fraction increases vehicle total mass-to-payload ratio, that vehicle energy utilization decreases with decreasing payload mass fraction (in response

to increasing battery mass fraction), and that the design range reaches an upper limit as battery mass fraction is increased.

by Robert F. McAlevy, 3rd.; Loris Redrosyan
Stevens Inst. of Tech., Hoboken, N.J.
Publ: HS-024 008 (SAE-P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 1," Warrendale, Pa., 1978 p655-61
Rept. No. SAE-789392; 1978; 9refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 012

PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION

The testing of sodium-sulfur (Na/S) cells designed to meet the steady-state power requirements of an electric vehicle (EV) has shown that they are also capable of meeting the peak power demands required during acceleration. In amplified prototype cells having an electrolyte area of 94 sq cm and weighing 735 g, power pulses of 15-sec duration in excess of 60 watts have been achieved over the entire operating range of the cells. These cells can be recharged to more than 80% of their theoretical capacity in less than 3 hrs and have excellent regeneration characteristics. Although peak power levels as high as 160W have been achieved in cells specifically designed for improved discharge capability, cells of this design cannot be recharged efficiently into the two-phase region. Attempts to form a simple model to predict pulse behavior of the Na/S cells have been successful in projecting qualitative aspects of cell performance but not in predicting quantitative values.

by M. Mikker; R. W. Misak; L. E. Unmewehr
Ford Motor Co., Engineering and Res. Staff, Dearborn, Mich. 48121
Publ: HS-024 008 (SAE-P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 1," Warrendale, Pa., 1978 p662-5
Rept. No. SAE-789393; 1978; 1ref
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 013

LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES

High-temperature lithium silicon/iron sulfide batteries are being developed at Atomic International for use in electric utility energy storage plants and in electric vehicles (EV's). Individual cells with a capacity of up to 2.5 kWh have been designed, built, and tested for the former application. Cells with capacities of approximately 150 Wh are being tested for EV batteries. Current research efforts are directed to the design and testing of lightweight, low-cost electrode structures, the development of negative and positive electrodes with high-rate discharge capabilities, and the identification of corrosion-resistant materials required for long life. Systems studies are being made to establish cost-effective means of providing the thermal and electrical controls for large battery

plants. Progress made in these areas in the past year is described.

by L. R. McCoy; S. Sudar; L. A. Heredy; J. C. Hall
Rockwell International, Atomic International Div., 8900 De
Soto Ave., Canoga Park, Calif. 91304
Publ: HS-024 008 (SAE-P-75-Vol-1; IERE-78-CH1372-2-
ENERGY-Vol-1), "Intersociety Energy Conversion
Engineering Conference (13th) Proceedings. Vol. 1,"
Warrendale, Pa., 1978 p702-8
Rept. No. SAE-789284; 1978; 10refts
Conference held at San Diego, Calif. 20-25 Aug 1978. Research
sponsored by Dept. of Energy, Argonne National Lab., and
Electric Power Res. Inst.
Availability: In HS-024 008

HS-024 014

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

A state-of-the-art Li (lithium)/MSx (metal sulfide) cell has been developed at Argonne National Lab. The favorable design features in this cell include overall compactness, evolution of an improved positive terminal-current collector connection, and the use of delicate ceramic-felt separators. The Li-Al (aluminum)/MSx cells using the compact design have shown significant specific energy and specific power improvements (100 W-hr/kg at the 4-hr discharge rate; 120 W/kg at 50% discharge) over earlier cell designs. The Li-Al/FeS (iron sulfide) compact cells have also demonstrated improved performance (65 W-hr/kg; 75 W/kg), although these are still short of the Mark IA (Li-AUMSx electric vehicle (EV) battery) performance goals (80 W-hr/kg). Use of thin electrodes of higher theoretical capacity density suggest that a multilayer cell design may provide the improved specific energy needed. Improvements in lifetime of both the Li-Al/FeS and Li-Al/MS2 (metal disulfide) cell systems (greater than 300 cycles and less than 20% decline in discharge capacity) have been achieved. Further development of the Li-Al/MS2 cell is needed to meet the 500-cycle lifetime goal for the Mark II battery. Ceramic-felt separators, thinner and lighter than previously used BN felt fabric, have provided good insulation and particle retention for greater than 300 cycles and 4500 hrs of continuous operation. A most significant improvement was the reduction of cell resistance to less than 3.5 m Ω /ohm through the use of a modified connection between the terminal rod and the current collector.

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South Cass Ave., Argonne, Ill. 60439
Publ: HS-024 008 (SAE-P-75-Vol-1; IERE-78-CH1372-2-
ENERGY-Vol-1), "Intersociety Energy Conversion
Engineering Conference (13th) Proceedings. Vol. 1,"
Warrendale, Pa., 1978 p709-16
Rept. No. SAE-789205; 1978; 10refts
Conference held at San Diego, Calif. 20-25 Aug 1978. Research
sponsored by Dept. of Energy.
Availability: In HS-024 008

(EV) propulsion. The batteries are refueled by the addition of anode plates and water, while the reaction product is withdrawn to be recycled at fixed industrial sites. Aluminum (Al) is most attractive for this application because of the large domestic industry expected in the 1980's. Battery performance is projected from reported cell data for hardware designed for rapid addition of electrodes. The reaction product is processed in the battery to form a purified, dry powder of anhydrous alumina, a feedstock of the current Al industry. For a 30-kW-peak battery weighing 220 kg to 250 kg, ranges of 500 km to 750 km are estimated for a one-ton vehicle. Costs of recycled Al and air-cathode modules comprise 85% of the total cost (ex. 5 cents/km) of battery ownership and operation. The major technical problems associated with the Al fuel concept lie with the low electrochemical efficiency of the battery and with the performance of the air cathode. There is much need for improvement in the anode voltage efficiency; and an adequate, low-cost cathode must be developed and tested under road-duty conditions. The large size of the hardware (reflected in an average specific gravity of 0.6) will require skillful engineering of the power cell to fit in conventional engine compartments. An optimized power system (motor, flywheel, drivetrain, and transmission) will have to be designed to match the low-power, constant output anticipated for the energetically-efficient discharge of the cell. In spite of these obstacles, it appears that the use of Al as an electrochemical fuel deserves careful consideration.

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Alto, Calif.
W-7405-ENG-48
Publ: HS-024 008 (SAE-P-75-Vol-1; IERE-78-CH1372-2-
ENERGY-Vol-1), "Intersociety Energy Conversion
Engineering Conference (13th) Proceedings. Vol. 1,"
Warrendale, Pa., 1978 p738-44
Rept. No. SAE-789283; 1978; 21refts
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 016

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES

The successful demonstration of the performance characteristics of both high-performance sintered-iron and bifunctional-air electrodes under expected electric vehicle (EV) use conditions make the iron-air battery a viable candidate for this particular application. State-of-the-art electrode performance characteristics in 100-sq-cm-size cells have demonstrated both sustained performance and acceptable characteristics. Design and development work to evaluate the system in prototype size 400 sq cm cells and modules must still be carried out to demonstrate the expected performance and life characteristics of the system. When fully developed, the iron-air battery system will have an energy content of 140 W-hr/kg at a 4-hr rate with a sustained peak power density of about 110 W/kg. The manufacturing cost of the fully-developed iron-air battery system is expected to be about \$30/kW-hr. Development work to date on both electrodes and cells has indicated that the per-

formance goals for a fully-developed system are reasonable and attainable.

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HS-024 008

Publ: HS-024 008 (SAE P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings, Vol. 1," Warrendale, Pa., 1978 p745-9
Rept. No. SAE-789284; 1978; 3refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 008

HS-024 017

RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-CONTROLLED DISCHARGE

An investigation was conducted to obtain data on battery response to the pulse discharges presented by chopper-speed controllers. Tests were made on a typical commercial lead-acid electric vehicle (EV) battery using a simulated EV chopper-speed controller. Delivered battery energy and power were determined for peak discharge currents of 200 A, 300 A, and 400 A and average current levels of 100 A, 200 A, and 300 A at frequencies of 50 Hz, 100 Hz, and 500 Hz. The results of the tests show that pulsing is not an efficient means of discharging at 100 A average current as stated previously; energy output losses up to 25% resulted with chopper-controlled discharge vs. constant current discharge. An energy output increase of 22% was observed in the 200 A average level and 44% increase at the 300 A level using pulse discharging. These results indicate that pulsing can be an efficient method of discharging and that EV battery/speed controller interactions must be considered in vehicle design.

by Robert L. Cataldo
National Aeronautics and Space Administration, Lewis Res. Center, Cleveland, Ohio 44135
Publ: HS-024 008 (SAE P-75-Vol-1; IEEE-78-CH1372-2-ENERGY-Vol-1), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings, Vol. 1," Warrendale, Pa., 1978 p764-8
Rept. No. SAE-789363; 1978; 3refs
Conference held at San Diego, Calif. 20-25 Aug 1978. Report is revised version of CONS(104)-1, NASA-TM-73834, "Response of Lead-Acid Batteries in Chopper-Controlled Discharge: Preliminary Results".
Availability: In HS-024 008

HS-024 018

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2

A compilation of papers presents the concerns of the world energy community and identifies the current centers of energy conversion activity and engineering applications. The following topics and subtopics are covered: energy storage systems; energy transport (general, heat pipes); geothermal power (geothermal energy applications); hydrogen energy systems (production, applications); international participation (energy in the long run-an international view); marine energy systems; magneto hydrodynamics; nuclear fission (general); nuclear fusion (fusion energy status after the first 20 years, fusion energy

technology); (plenary session) energy in the long run-a comprehensive overview; Rankine cycle (general systems, organic working fluids); solar energy conversion (solar power plants and energy systems, solar concentrators, thermoelectric-photovoltaic systems, solar heating and cooling); and space nuclear power (isotopic power sources and systems).

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-P-75-Vol-2; IEEE-78-CH1372-2-ENERGY-Vol-2; 1978; 819p refs
Includes HS-024 019-HS-024 023. Vol. 1 is HS-024 008; Vol. 3 is HS-024 024.
Availability: SAE

HS-024 019

SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED SPARK IGNITION ENGINE

Experimental and theoretical studies demonstrate some advantages and disadvantages of burning hydrogen (H₂) in the spark ignition (SI) engine. Induction ignition or back-flashing associated with H₂ engines is shown to be caused by deposit ignition or residual gas ignition. A correlation was made of predicted boundaries of the onset of induction ignition using a model for predicting performance and emissions of an H₂ (or CH₄ (methane)) engine which includes the residual gas mixing process, and results of experimental studies with a CFR (Cooperative Fuel Research) engine using H₂ fuel. Results from tests using a single-cylinder engine modified to overcome residual gas ignition (use of timed port admission) show that operation free of induction ignition is possible at all mixtures and compression ratios up to knock and beyond. Results of experimental studies with a 4-cylinder, 2-liter engine converted for use of H₂ led to the conclusion that induction ignition is caused by some variable source such as deposit or surface activity, rather than a hot spot which might be expected to be a repeatable ignition source. Coating the combustion chamber surfaces and piston crown with lead oxide eliminated induction ignition for a short time period. Addition of lead to the lubricating oil partly suppressed induction ignition. Other engine modifications affected onset induction but did not eliminate it. Beneficial results from tests using the typical automotive engine show that thermal efficiencies on the average were twice that for gasoline, and specific NO_x (nitrogen oxides) emissions were always less than with gasoline (1/200 to 1/3). When the single-cylinder results are compared with those of the multi-cylinder engine, it is concluded that much improved oil control and cylinder preparation to avoid scuffing will be needed to eliminate induction ignition at high specific outputs, in the presence of low-pressure admission systems compatible with metal hydride supply tanks.

by Harry C. Watson; Eric E. Milkins
University of Melbourne, Dept. of Mechanical Engineering, Parkville, Vic. Australia
Publ: HS-024 018 (SAE P-75-Vol-2; IEEE-78-CH1372-2-ENERGY-Vol-2), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings, Vol. 2," Warrendale, Pa., 1978 p1370-7
Rept. No. SAE-789212; 1978; 13cfs
Conference held at San Diego, Calif. 20-25 Aug 1978. Research sponsored by Shell Australia, Ford Motor Co., and Repco Res.
Availability: In HS-024 018

HS-024 020

PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER

Industrial, domestic and community utilization of hydrogen as a fuel to reduce dependence on petroleum products is discussed in terms of demonstration projects completed and/or ongoing at Billings Energy Corp. Much progress is being made in demonstrating the utility and safety of hydrogen in highly visible projects involving fleet-type vehicles such as commercial buses (Riverside, Calif. transit system) and Postal Service delivery vehicles, domestic and farm vehicles, and use within the home (the latter three applications as demonstrated in the "Hydrogen Homestead", Provo, Utah, a private dwelling in which natural gas appliances have been converted for hydrogen operation). The use of hydrogen is demonstrated to integrate with alternate primary energy sources and energy conservation techniques such as solar and hydroelectric energy and heat pumps. Information is also presented on some hydrogen production sources (electrolyzer and hydride technology) and economics of their use. A source of competitively-priced hydrogen for use by large single users or small municipalities has been identified and further demonstration is underway (Forest City, Iowa, coal gasification plant). Each demonstration project successfully testifies to the viability of hydrogen as an energy carrier, and the economic studies indicate that hydrogen fuel can be competitive with today's energy prices.

by J. H. Ruckman; R. E. Billings; R. L. Woolley; R. C. Campbell; L. D. Hadden; V. R. Anderson
Billings Energy Corp., Provo, Utah
Publ: HS-024 018 (SAB-P-75-Vol-2; IEEE-78-CH1372-2. ENERGY-Vol-2), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 2," Warrendale, Pa., 1978 p185-90
Rept. No. SAE-789214; 1978; 6refs
Conference held at San Diego, Calif. 20-25 Aug 1978. Research sponsored by Four Corners Regional Commission; Mountainland Assoc. of Governments; Postal Service; CALTRANS and the State of California; The City of Riverside, Calif.; John K. Hanson; The City of Forest City, Iowa; Brookhaven National Labs.; Jacobsen Tractor; and Tappan.
Availability: In HS-024 018

HS-024 021

PROSPECTS FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS

Fundamental characteristics of the internal combustion (IC) engine are examined in terms of potential improvements to reduce pollution and to increase efficiency. The advantages of the IC engine, associated with its impressively high level of flexibility and reliability, are related to the intrinsic superiority of both the internal combustion system as the most convenient heat source for an energy conversion cycle and oil fuel as the most compact energy accumulator. The disadvantages, such as harmful environmental effects and relatively poor fuel economy, are related primarily to the conditions under which the

this purpose requires operation with a completely pre-vaporized, homogeneously pre-mixed, and extra-lean charge. In principle, these conditions can be achieved by multiple ignition sources and enhancement of combustion rate. Multi-point ignition can be theoretically achieved by impregnating the charge with active radicals which enhance the induction process and speed up the onset of exothermic reactions; impregnation can be accomplished by photolysis or by jet ignition (plasma jets obtained by electric discharge, or radical jets obtained by combustion as in the LAG process). In the combustion process, rapid spread of combustion and protection from harmful wall effects are the two basic requirements. Rapid spread can be achieved by proper fluid mechanics, such as swirl and turbulence. Protection from wall effects involves heat transfer and fluid-mechanic effects combined with chemical reactions taking place in the quench layer. The background of knowledge obtained in current studies of the ignition and combustion of extra-lean mixtures, enhanced by the concomitantly developed techniques for experimental as well as computational modeling, and assisted by accurate diagnostic tools, should have a decisive influence upon the understanding of processes occurring in IC engines in order to assure a significant improvement in their performance as relatively clean and efficient prime movers.

by A. K. Oppenheim
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DDE-W-7405-ENG-48
Publ: HS-024 018 (SAB-P-75-Vol-2; IEEE-78-CH1372-2. ENERGY-Vol-2), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings. Vol. 2," Warrendale, Pa., 1978 p192-200
Rept. No. SAE-789632; 1978; 28refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 018

HS-024 022

COMBINED CYCLE GAS TURBINE FOR AN AUTOMOBILE APPLICATION

Factors affecting transient response, emissions, and manufacturing costs of a combined cycle gas turbine-organic fluid Rankine automobile engine are discussed. A unique design, designated "IBR" (Integrated Brayton-Rankine) engine, couples the two cycles thermodynamically and mechanically to allow the single Brayton turbine to function as a free power turbine under most operating conditions. Several unconventional cycle modifiers (exhaust gas circulation and inlet throttling) are used to improve part-load efficiency and to reduce exhaust emissions without resorting to variable flow-path geometry. An 82-kW (110-hp), all-metal IBR engine based on near-term state-of-the-art component efficiencies in a 1588-kg (3500-lb) vehicle is predicted to provide 18% better than average fuel economy compared to an equivalent Otto-cycle-powered vehicle. An advanced technology ceramic turbine engine is predicted to provide a 45% improvement in fuel mileage for the same vehicle. This engine offers the potential for high efficiency, responsiveness, low emissions, and reasonable manufacturing cost (related to minimum use of critical materials).

by Ernest R. Earnest
SAE Trans. Ser. 87-01-01, 1987, p. 1-10

Engineering Conference (13th) Proceedings, Vol. 2,
Warrendale, Pa., 1978 p1465-73
Rept. No. SAE-789525; 1978; 13 refs
Conference held at San Diego, Calif. 20-25 Aug 1978.
Availability: In HS-024 018

HS-024 023

TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE

The thermodynamic and mechanical design aspects are described of a steam engine which is expected to achieve a net brake thermal efficiency of 27% after two years and 30% within five years. This high level of thermal efficiency will be attained through the use of double expansion, reheat between stages, combustor exhaust-heat recovery, steam exhaust-heat recovery, elevated temperatures and pressures (1300 degrees F and 1500 psi), and reduced parasitic and accessory power losses.

by Ted J. Smith
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Publ. HS-024 018 (SAE-P-75-Vol-2; IEEE-78-CH1372-2-ENERGY-Vol-2), "Intersociety Energy Conversion Engineering Conference (13th) Proceedings, Vol. 2," Warrendale, Pa., 1978 p1476-80
Rept. No. SAE-789526; 1978; 3 refs
Conference held at San Diego, Calif. 20-25 Aug 1978. Report prepared in cooperation with California Dept. of Transportation.
Availability: In HS-024 018

HS-024 024

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3

A compilation of papers presents the concerns of the world energy community and identifies the current centers of energy conversion activity and engineering applications. The following topics and subtopics are covered: Stirling cycle (analysis, simulation, and optimization); design, application, and measurement; thermionic energy conversion; thermoelectric energy; unique power systems; urban energy advances; and wind power (technology of propeller-type wind turbine, advanced wind turbine concepts). Late papers are presented on topics covered in Vol. 1 and Vol. 2, as well as abstracts of papers published in the Proceedings of the 1975, 1976, 1977, and 1978 Intersociety Energy Conversion Engineering Conferences (IECEC). Included are subject and author indexes for papers published in the 1974 (9th) through 1978 (13th) IECEC Proceedings.

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-P-75-Vol-3; IEEE-78-CH1372-2-ENERGY-Vol-3; 1978; 738p refs
Vol. 1 is HS-024 026; Vol. 2 is HS-024 018.
Availability: SAE

HS-024 025

LET THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL

The Dept. of Transportation (DOT) has proposed raising legal candlepower of automotive headlamps from 75,000 cp to 150,000 cp if lamps can be made in seal-beam configuration. General Electric has responded by announcing a seal-beam halogen replacement for both single and dual headlamps. Four types of lamps (round high-beam for 4-lamp systems, round for 2-lamp systems, rectangular high-beam for 4-lamp systems, and rectangular for 2-lamp systems) will be available in limited quantities in 1978. On cars with four headlights, either round or rectangular, the new units will replace the high-beam lights. Larger units for single replacement will contain both high-beam and low-beam filaments. Tests have shown that high-beam visibility will be extended up to 25% over present lights, with whiter and brighter illumination giving a sharper view of distant objects. Seal-beam halogens will be considerably higher in price than present lamp replacements.

by Chuck Nerpel
Publ. Motor Trend v30 n9 p55 (Sep 1978)
1978
Availability: See publication

HS-024 026

THE ROTARY IS NOT DEAD (WANKEL ENGINE)

Solutions to some of the early problems associated with the rotary engine are being actively pursued worldwide by such companies as Toyota Kogyo, Toyota, Audi/NSU, Ingersoll-Rand, and Curtiss-Wright. The recent past has yielded significant improvements in such areas as sealing, durability, and combustion efficiency. More exciting progress lies ahead in developments such as stratified-charge, improved fuel-delivery systems, and more sophisticated ignition. In spite of inherent fuel economy and emissions problems due to the engine's oddly shaped rotor and incombustion, the successful use of thermal reactors and/or catalytic converters seems to indicate emissions will not be greater than with piston engines, perhaps less. Despite the inherent rotary simplicity, production costs are still higher than for piston engines, partly because of the highly specialized tooling, and partly because of the low-production volume of the still-novel fuel controls and ignition components. On the positive side, the rotary is wonderfully suited to small, front-drive cars, because of compactness, light weight, and smoothness. It is felt that these attractions are great enough to keep rotary development going.

by E. F. Lindsay
Publ. Popular Science v213 n3 p78-81 (Sep 1978)
1978; 4 ref
Availability: See publication

HS-024 027

MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS (HEADLIGHTS)

In response to the Federal government's revision of its automotive lighting regulations to allow the use of higher-intensity headlamps, manufacturers have produced a new generation

from 75,000 candlepower to 100,000 cp). The big advantage of halogen is that it gives substantially more light with the same amount of electricity. The new halogen headlamps look just like standard incandescent sealed-beams. Unlike European quartz-halogen headlamps, which have separate lenses, bulbs, and metal reflectors, those approved in the U.S. are one-piece, hermetically-sealed units with a glass lens and reflector. Although halogen sealed-beams are exact retrofits for the incandescents, they have no naked filament inside. The filament(s) are housed in a bulb made of quartz or hardened glass, to withstand the intense heat produced. The halogen lamp's filament burns hotter because it is very slightly thinner, increasing its efficiency to produce a more intense and "whiter" light than the "yellow" incandescent beam. Manufacturers claim that the sealed-beams will last as long as the incandescents. The new halogen sealed-beams will be made by General Electric, General Motors' Guide Div., Wagner Electric, Westinghouse, and Sylvania. Some manufacturers have indicated that the new lamps will cost several times more than standard incandescents. In high-beam driving, about a 25% greater seeing distance is expected with halogens. Halogen sealed-beams will be phased in gradually, as many drivers will probably continue buying the less expensive incandescents.

by Herbert Shauliner
Publ: Popular Science v213 n3 p50, 52-3 (Sep 1978)
1978
Availability: See publication

HS-024 028

IS YOUR CAR KILLING YOU? OR RATHER, ARE ITS SEATS?

The design of car seats for the comfort, orthopedic suitability, and safety of the passenger is discussed. A good driving position should include relaxed and slightly bent arms that can reach the top of the steering wheel without moving shoulders off the seat back, a correctly supported spine, bottom well tucked into the angle formed by the seat back and cushion, and no hindering of leg movement. A correctly positioned body has a better chance of survival in a rear impact accident. The spine can endure considerable loads, given a correctly supportive seat, seat belts, and large head restraint. Lumbar support and cushion curvature that place more of the body weight on the thighs are essential. It is thought possible to produce a lumbar support that will satisfy 95% of the adult population's orthopedic requirements. The position of the support might need altering, but its form, by careful choice of foam density and the right double curvature, can remain the same. Little medical input is available in the design of automobile car seats. The technology is available to produce the perfect seat, but the manufacturers cite costs as prohibitive, and most manufacturers have limited their efforts to competition-spurred updating. The seating engineer and stylist have been most concerned to meet necessary legislation regarding the strength of seats and to reduce weight, while providing visual appeal, trim and upholstery durability, and control of manufacturing tolerances. The evidence is that seats are designed mainly by experience and subjective input. Competition between manufacturers and the dawning of an awareness that serious back trouble results from poor car seating is slowly producing results. More work is being done now on the development of seat suspension to damp out the inadequacies of the vehicle springing; and there is a trend towards firmer, more supportive, seating, with a greater range of adjustability. The comfort aspect (based on published criteria in "Slipped

Disc") of seats in 19 vehicle models (mostly European) is cited, and a review is presented of special replacement seats and available cockpit accessories (steering wheels).

by John Miles
Publ: Autocar v149 n4268 p23-5, 27-9 (26 Aug 1978)
1978
Availability: See publication

HS-024 029

BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)

Automotive braking in Europe is apparently changing rapidly. Mercedes-Benz is the first European company which is about to introduce a full anti-skid system in one of its cars (the 450 SEL 6.9). The high cost of anti-skid systems, compounded by legislation on product liability, is causing manufacturers to question the practicality of such systems. Engineers are also questioning the value of the anti-skid system. Whether other companies will follow Mercedes-Benz will depend on the sales record of cars with anti-skid systems. The EEC (European Economic Community) 75/524 regulation in Oct 1978 dictated front-to-rear braking effort in all conditions, requiring divided circuits and a brake failure indicator. To provide brake balance, the regulation's aim is that in decelerations up to 0.8 g, the front wheels lock before the rear wheels. In many cases, this regulation involves the addition of some type of valve in the rear brake circuit, such as a load-apportioning valve or a G-valve. Automotive Products (AP) has introduced a transversely-apportioned braking, TAB, system, to reduce the pressure that can be applied to the inner brake to aid in braking on cornering. All-disc brake systems may become more popular, since the problems of the early rear discs seem to have been resolved. The trend is towards single-cylinder caliper design, in which one pad is pushed against the disc by the piston, and the reaction force allows the whole caliper to pivot, forcing the second pad, which is fixed to the caliper, against the disc. The problem of brake fluid vaporization seems to have been overly exaggerated. There may be the beginning of a trend toward the use of power braking vs. vacuum power-assisted braking. Bavarian Motor Works has adopted a full power actuation system for the 7 Series models, the equipment being supplied by ATE.

by John Hankley
Publ: Autocar v149 n4268 p47-9 (26 Aug 1978)
1978
Availability: See publication

HS-024 030

AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORKING PLAN

A working plan is presented for a twofold study of the Driver Improvement Program of the Virginia Div. of Motor Vehicles. The program, established in Jan 1975, is a multifaceted and comprehensive approach to eliminating aberrant driving, and consists not only of a point system for the identification and referral of chronically negligent drivers but also a system of remediation designed to treat these drivers. Available treatments include advisory letters, group and personal interviews,

private are devoted to new technology that may be used to modify unsafe driving behavior. The evaluation study to be conducted is designed to determine the impact of the Driver Improvement Program on Virginia's traffic and safety environment in terms of reduced accidents and traffic convictions, and to establish an ongoing system of data collection to be used independently by the Div. of Motor Vehicles. The general design of the study involves the comparison of experimental groups receiving treatment with control groups not receiving treatment to determine the effectiveness of three levels of remediation (advisory letter, group interview, and personal interview/driver improvement clinic). Data collection will start as soon as subjects are assigned to a study group and will continue for two years. Appendixes are: the Virginia Driver Improvement Act, and an amendment to it; summary of violation and assigned point values; correspondence relating to assignment to the Driver Improvement Program; initial data format; and variables to be incorporated into analysis of variance.

by Cheryl Lyon
Virginia Hwy. and Transportation Res. Council,
Charlottesville, Va.
Rept. No. VHTRC-79-WP8; 1978; 67p 1ref
Sponsored by Virginia Dept. of Transportation Safety;
prepared in cooperation with Virginia Div. of Motor Vehicles.
Availability: Virginia Dept. of Transportation Safety

HS-803 324

**PERFORMANCE CHARACTERISTICS OF
AUTOMOTIVE ENGINES IN THE UNITED STATES.
FIRST SERIES, REPORT NO. 14: 1975 MAZDA
ROTARY 70 CID (1.1 LITERS), 4V. INTERIM
REPORT**

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied engine service and duty, experimental data were obtained in dynamometer tests of a 1975 Mazda 70 CID (cubic-inch-displacement), 4V rotary engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state engine-operating modes. Mazda uses this particular engine in both model RX-3 sedan and RX-3 wagon. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

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NH TSA-RA-75-10
Fabi: Transportation Systems Center, Kendall Square,
Cambridge, Mass. 02142
Rept. No. DOT-TSC-NH TSA-78-8; BERC/OA-76/32; 1978; 40p
Rept. for Aug 1977. See also HS-803 325-HS-803 335.
Availability: NTIS

HS-803 325

**PERFORMANCE CHARACTERISTICS OF
AUTOMOTIVE ENGINES IN THE UNITED STATES.**

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied engine service and duty, experimental data were obtained in dynamometer tests of a 1975 Dodge Colt 1.6 liter (98 CID (cubic-inch-displacement)) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide and nitrogen oxides at steady-state engine-operating modes. This engine, manufactured in Japan by Mitsubishi, is used in compact-size vehicles sold in the U.S. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

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Box 1398, Bartlesville, Okla. 74003; Transportation Systems
Center, Kendall Square, Cambridge, Mass. 02142
NH TSA-RA-75-10
Rept. No. DOT-TSC-NH TSA-78-9; BERC/OA-77/42; 1978; 41p
Rept. for Aug 1977. See also HS-803 324, HS-803 326-HS-803
335.
Availability: NTIS

HS-803 326

**PERFORMANCE CHARACTERISTICS OF
AUTOMOTIVE ENGINES IN THE UNITED STATES.
FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121
CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM
REPORT**

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1975 Volvo 2.0 liter, 121 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state operating modes. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for establishing steady-state maps of fuel consumption and emissions for this engine.

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NH TSA-RA-75-10
Rept. No. DOT-TSC-NH TSA-78-10; BERC/OA-77/41; 1978;
36p
Rept. for Aug 1977. See also HS-803 324, HS-803 325, HS-803
327-HS-803 335.
Availability: NTIS

HS-803 327

**PERFORMANCE CHARACTERISTICS OF
AUTOMOTIVE ENGINES IN THE UNITED STATES.**

FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1975 Buick 455 CID (cubic-inch-displacement), 4V engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state operating modes. This engine is used by Buick in full-size vehicles (Riviera, Electra 255, Electra Limited, and Estate Wagon). The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable to establish steady-state maps of fuel consumption and emissions for this engine.

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NHTSA-RA-75-10
Rept. No. DOT-TSC-NHTSA-78-11; BERC/OP-77/44; 1978; 56p
Rept. for Aug 1977. See also HS-803 324--HS-803 326, HS-803 328--HS-803 335.
Availability: NTIS

HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1976 Ford 400 CID (cubic-inch-displacement), 2V engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state operating modes. This engine is used in Ford and Mercury full-size vehicles (Custom, LTD, etc.). The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

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NHTSA-RA-75-10
Rept. No. DOT-TSC-NHTSA-78-12; BERC/OP-77/52; 1978; 57p
Rept. for Aug 1977. See also HS-803 324--HS-803 327, HS-803 329--HS-803 335.
Availability: NTIS

HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD

WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S. for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1975 Ford 351 CID (cubic-inch-displacement), 2V, Windsor engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state engine operating modes. This engine is used in Ford full-size vehicles (Torino, Elite, and Granada). The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

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NHTSA-RA-75-10
Rept. No. DOT-TSC-NHTSA-78-13; BERC/OP-77/53; 1978; 42p
Rept. for Aug 1977. See also HS-803 324--HS-803 328, HS-803 330--HS-803 335.
Availability: NTIS

HS-803 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a modified 1975 Chevrolet 350 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state engine operating modes. A prototype variable-area venturi carburetor manufactured by Dresser Industries was used in place of the standard carburetor system. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

by T. W. Chamberlain; D. E. Koehler; K. R. Stamper; W. F. Marshall
Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003; Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142
NHTSA-RA-75-10
Rept. No. DOT-TSC-NHTSA-78-14; BERC/OP-77/56; 1978; 47p
Rept. for Nov 1977. See also HS-803 324--HS-803 329, HS-803 331--HS-803 335.
Availability: NTIS

HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES.

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1976 Chevrolet 85 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state engine-operating modes. This engine is used in the Chevelle models (2250-lb weight class). The basic engine characteristic data present required input for engineering calculations involving ground transportation. Fuel consumption rates were found to be repeatable for those tests which were duplicated.

by D. E. Kochler; T. W. Chamberlain; K. R. Stamper; W. F. Marshall

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NHTSA-RA-76-23

Rept. No. DOT-TSC-NHTSA-76-13; BERC/OP-77/58; 1978; 55p

Rept. for Nov 1977. See also HS-803 324-HS-803 330, HS-803 332-HS-803 335.

Availability: NTIS

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1977 Ford 2.3 liter, 140 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state operating modes. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable to establish steady-state maps of fuel consumption and emissions rates for this engine.

by T. W. Chamberlain; D. E. Kochler; K. R. Stamper; W. F. Marshall

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NHTSA-RA-76-23

Rept. No. DOT-TSC-NHTSA-76-16; BERC/OP-77/57; 1978; 62p

Rept. for Nov 1977. See also HS-803 324-HS-803 331, HS-803 333-HS-803 335.

Availability: NTIS

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1976 Nissan diesel engine, Model SD-33 CN6-33, to determine fuel consumption and emissions of hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides at steady-state engine-operating modes. This engine is imported by Chrysler. The basic engine characteristic data present required input for engineering calculations involving ground transportation. The HC and CO emission patterns were found to be highly irregular, and the smoke rates were slightly scattered, due to a drift in calibration of the smoke meter. The latter problem was resolved by running duplicate tests at the same modes. Fuel consumption rate increased with brake horsepower.

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NHTSA-RA-76-23

Rept. No. DOT-TSC-NHTSA-76-17; BERC/OP-77/61; 1978; 36p

Rept. for Nov 1977. See also HS-803 324-HS-803 332, HS-803 334, HS-803 335.

Availability: NTIS

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1977 Ford 171 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides at steady-state engine-operating modes. This engine, used in Pinto wagon and Mustang II models (3000 lb-3500 lb weight class), features an air-injection system in the exhaust for post-combustion oxidation of HC and CO. This system affects the calculation of air/fuel ratios. The basic engine characteristic data present required input for engineering calculations involving ground transportation.

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NHTSA-RA-76-23

Rept. No. DOT-TSC-NHTSA-76-18; BERC/OP-77/62; 1978; 65p

Rept. for Nov 1977. See also HS-803 324-HS-803 333, HS-803 335.

Availability: NTIS

HS-803 335

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130

CID (2.1 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

As part of a program to obtain performance data on engines used in automobiles sold in the U.S., for estimating emissions and fuel economy for varied service and duty, experimental data were obtained in dynamometer tests of a 1977 Volvo 130 CID (cubic-inch-displacement) engine to determine fuel consumption and emissions of hydrocarbon, carbon monoxide, and nitrogen oxides at steady-state engine-operating modes. This engine, equipped with a Lambda-Sond system (fuel-injection system with a closed-loop feedback control circuit), is used in vehicles in the 3000 lb-3500 lb weight class. The basic engine characteristic data present required input for engineering calculations involving ground transportation, and are considered sufficiently repeatable for the purpose.

by D. E. Koehler; K. R. Stamper; W. F. Marshall
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NHTSA-RA-77-07
Rept. No. DOT-TSC-NHTSA-78-19; BERC/OP-77/60; 1978; 46p
Rept. for Nov 1977. See also HS-803 324-HS-803 334.
Availability: NTIS

HS-803 418

STATISTICAL ANALYSES OF COMMERCIAL VEHICLE ACCIDENT FACTORS. VOL. 1, TECHNICAL REPORT, PT. 1. FINAL REPORT

Procedures for conducting statistical analyses of commercial vehicle accidents were established and initially applied. A file of 3000 California Hwy. Patrol accident reports from two areas of California in 1975-76 provided the data base for the application. After computer implementation and evaluation of the quality of the data file, an exhaustive univariate analysis of the data was conducted to describe the file in detail. Selected sets of dependent and independent variables were then subjected to linear regression analysis. The resulting linear models of the interactions of the variables were found to be unsatisfactory. More complex models of the interactions were then constructed with contingency table analysis methods, and acceptable log-linear models to explain these interactions were successfully established. Vehicle exposure, introduced into one of these analyses to assess its impact on the set of significant interactions, was found to be important. The estimation of exposure was carried out by two independent methods: a "direct" procedure based on a series of linear extrapolations of basic State of California commercial vehicle traffic data, and an "induced" estimation procedure employing only data in the accident reports. While necessarily limited in scope, certain initial accident causation and countermeasure implications were established from these analyses. These related to multi-unit jackknife and brake-related accidents and accident severity. Finally, a brief investigation was made of the effect of considering economic costs of accidents instead of only the frequency of their occurrence. Appended are a table of contents to univariate frequency tables, histograms, and descriptive statistics; accident report forms and instructions for completing and coding; computations descriptions; other potential exposure data sources; potential procedure for

extracting accident data, and a mathematical framework of the contingency table analysis methodology.

by L. L. Philipson; P. Rashti; G. A. Fleischer
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DOT-HS-7-01363
Rept. No. 78-1; PB-284 436; 1978; 395p refs
Rept. for Feb 1977-Feb 1978. Summary rept. is HS-803 419.
Text of Appendix A (vi, pt. 2) may be consulted at National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis.
Availability: NTIS

HS-803 432

INJURY SCALING RESEARCH. FINAL REPORT

In an attempt to improve the usefulness of accident data for the National Hwy. Traffic Safety Administration's safety systems analyses, threat-to-life, disability, and (direct) cost scales were developed using somewhat limited existing accident and injury data. These scales utilize data elements which are readily available from Level-2-type accident investigations, are easily automated, and are compatible with medical codes on other existing files. Using the Illinois Trauma Registry, a 16-point ICDA (Injury Category Data Analysis) threat-to-life scale was developed which predicts the unconditional probability of death prior to release from the hospital as a function of primary injury, occupant age, presence or absence of severe secondary injury, and extent (or number) of injuries. A 9-point AIS (Abbreviated Injury Scale) threat-to-life scale was also developed which predicts the probability of fatality if the occupant has arrived alive at the treatment facility. The acute disability scale which was developed predicts compensation awarded for disability as a function of primary injury (described by body part and nature), age and sex of occupant, and extent (or number) of injuries. The calibration of the scale used data from the North Carolina Workmen's Compensation File (WCF). The seven resulting injury groups provided input to the final regression model containing main effects for injury category and two-way interactions with age and sex of occupant and extent of injury. This regression model represents the acute disability scale. The direct cost scale predicts disability costs and medical costs by place of treatment for injuries sustained in accidents. The medical portion was derived primarily from the N.C. Blue Cross Blue Shield (BCBS) File and is specific to place-of-treatment. The final direct cost scale is a composite of the disability scale together with the medical cost by place-of-treatment scale. Validation, to the extent possible, was carried out using both the Restraint Systems Evaluation Program (RSEP) File and the initial 1320 cases in the National Crash Severity Study (NCSS) File. Recommendations for future work concern the following: overall management of the Continuous Sampling System (CSS) within the National Accident Sampling System (NASS), sampling procedures for CSS investigations, investigator training and field data forms for the Phase I program of NASS, and (injury) data elements on the CSS data forms.

by D. W. Reinfort; J. R. Stewart; R. G. Hall; A. K. Dotti; J. C. Stotts; L. K. Li; J. B. Markley
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DOT-HS-7-01339

HS-803 454

AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT

North Carolina data on vehicle mileage, traffic volumes, accident frequencies and severity, crash rates, and driver characteristics are examined in order to understand the nature of the changes in the highway environment and accident scene due to the energy crisis of early 1974 and resulting conservation measures, and to identify possibly significant factors in the lower number of fatal accidents. Most of the analyses involve a comparison of data for the first four months of 1973, 1974, and 1975. Where trends have been in effect for several years, certain variables such as overall vehicle mileage and accident rates are examined using techniques from time series analysis. Estimates of total vehicle mileage (based on 1962-1973 data) for the entire state for the first four months of 1974 and 1975 indicate that the observed figures were 13.7 and 11.3% below expectation, respectively. Mean travelling speeds decreased on all types of rural roads despite the fact that a substantial portion of the roads had posted speed limits of 55 mph or less prior to the energy crisis. In 1975, mean speeds returned to pre-crisis levels on all roads except interstate highways where the speed limit changes were greatest. Speed variability, which is related to the rate of accident involvement, decreased on primary highways in 1974 and remained down in 1975. In 1974, total crashes fell 10% from the previous year while fatal crashes dropped 23%. The number of total crashes returned to pre-crisis levels in 1975, but the number of fatal crashes continued to fall, resulting in a net decrease of 24% over 1973. As anticipated, overall crash severity as indicated by Traffic Accident Data severity scores decreased significantly in both 1974 and 1975 for rural roads. Surprisingly, the analysis of driver injury indicated a significant increase in severity between 1973 and 1974 on rural primary highways with posted speed limits originally greater than or equal to 55 mph. However, by 1975 the distribution had shifted away from the extremes so that the net result was a shift into the slight and moderate injury categories. Mean travelling speeds prior to accidents did not change during the three years. Furthermore, crash rates failed to reveal any dramatic interruption during the crisis period. A comparison of the percentage change in Average Daily Traffic and total crashes revealed that a substantial portion of the reduction in total crashes for Interstate and U.S. Highways was not predicted by decreased volume. The complex, interactive, and seemingly contradictory nature of the changes that took place are illustrated. Reduced travel contributed significantly to the lower number of fatal accidents. The effect of the lowered speed limit on accident frequency was not as clear-cut as its beneficial effect on accident severity.

by Andrew F. Seila; Mark A. Entsminger; Claudio Z. Silva
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DOT-HS-4-00897
1977; 214p 1976a
Rept. for 1 Jul 1974-30 Jun 1977.
Availability: NTIS

HS-803 460

DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT

The role of state road tests is examined, emphasizing the tests' usefulness as screening devices, diagnostic tools, and educational instruments, and the short and long term research needs in this area are identified. The study included a review of the literature on performance tests, review of performance testing in other transportation modes, preparation of an interim report, and a conference held to consider the present and potential roles of state road tests and to identify research needs. The conference involved participants with expertise in operations, law, and research in driver licensing and human performance. This final report summarizes the conclusions drawn from the preparatory work. The road test is currently used primarily as a criterion to guarantee that beginning drivers have achieved a minimal level of skill. The role of the test for diagnostic and educational purposes is less clear. Short term research should focus first on compiling a road test based on the best elements of those carefully developed performance tests available. Other short term research should examine route selection, tests for operators of motorcycles and heavy trucks, use of the test as a motivator, and the demography of existing state road tests. Long term research should first identify those human performance parameters that differentiate between novice and experienced drivers. This information will provide the basis for a meaningful licensing program that should be coordinated with driver training, and highway engineering and vehicle design. Implications of this long term research for licensing, diagnosis and education are discussed. Appendices include a list of participants and the discussion topics for the Belmont Road Test Conference.

by Patricia F. Waller; Livia K. Li; Robert G. Hall; Jane C. Stuts
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DOT-HS-7-01698
1978; 152p refs
Rept. for 15 Sep 1977-13 Mar 1978.
Availability: NTIS

HS-803 468

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL REPORT

Descriptions and evaluations are presented of the adjudicative-disposition systems in operation in five areas with Alcohol Safety Action Projects (ASAP's), which had undergone significant change in the legal or judicial system or had developed innovative approaches for handling drinking-driving cases. A summary and analysis of the case-study findings are presented for the ASAP's in Puerto Rico; Phoenix, Ariz.; Los Angeles, Calif.; Hennepin County, Minn.; and Idaho. Final conclusions and policy recommendations are given. The study team recommends that the National Hwy. Traffic Safety Administration disseminate as widely as possible their expertise gained from the ASAP programs now being curtailed. Also recommended are further development and support of the basic ASAP "systems approach" in order to increase the efficiency and effectiveness of judicial and court systems.

further detailed work with Federal executive agencies (e.g. NIAAA) and professional bodies (e.g. American Medical Assoc.) to determine the proper relationship between court actions and the social and medical theory of alcoholism recovery; examination of social policy decisions to develop a national policy toward drinking-driving based on professional knowledge; and cooperation with legal associations to create model legislation and standards for court processing of drinking-driving cases.

by James A. Palmer, Raymond J. Ripberger; David T. Skelton; Gary J. Springhouse
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DOT-HS-4-00958
1978; 149p refs
Rept. for Jun 1974-Jul 1977. Vols. 2-6 are HS-803 469--HS-803 473.
Availability: NTIS

HS-803 469

**EVALUATION AND SYSTEM DESCRIPTION OF
ASAP [ALCOHOL SAFETY ACTION PROJECT]
JUDICIAL SYSTEMS. VOL. 2: PUERTO RICO CASE
STUDY. FINAL REPORT**

As one of five case studies of Alcohol Safety Action Projects (ASAP's) which had undergone significant change in the legal or judicial system or had developed innovative approaches for handling drinking-driving cases, this study was undertaken to assess the impact on the Puerto Rico ASAP of the statutory adoption of the National Hwy. Traffic Safety Administration's operational definition of a problem drinker as the legal definition for court disposition purposes, and a mandated presence investigation and drinker-type classification of all convicted drinking-driving offenders. It was found that the Puerto Rico ASAP successfully created, implemented, and tested a viable system of drinking-driver control through legislative enactment in 1973, where no such system had previously existed. However, additional legislation in 1975 returned to defendants the right to choose a BAC (blood alcohol concentration) testing method (which was shifted from the defendant to the arresting officer in the 1973 legislation) and required completion of the Driver Improvement School course by offenders within 30 days, thus creating severe administrative problems. These and other revisions appeared likely to reduce much of the progress made by the 1973 law.

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DOT-HS-4-00958
1978; 114p refs
Rept. for Jun 1974-Jul 1977. Vol. 1 is HS-803 468; vols. 3-6 are HS-803 470--HS-803 473.
Availability: NTIS

HS-803 470

**EVALUATION AND SYSTEM DESCRIPTION OF
ASAP [ALCOHOL SAFETY ACTION PROJECT]
JUDICIAL SYSTEMS. VOL. 3: IDAHO CASE STUDY.
FINAL REPORT**

As one of five case studies of Alcohol Safety Action Projects (ASAP's) which had undergone significant change in the legal or judicial system or had developed innovative approaches for

handling drinking-driving cases, this study examined the operation of Idaho's ASAP system with its progressive judicial system structure (a unified, statewide court system and centrally-administered presence investigation), and the impact on that system of the state's stringent drinking-driver control laws, i.e. .08% BAC (blood alcohol concentration) presumptive limit and mandatory penalties. It was found that the magistrate courts continued to have widely varying practices in the handling of drinking-driving cases, despite court unification. Inadequate presence investigation resources were thinly spread over a large jurisdiction; this created management problems and uneven results, since many courts did not have access to the investigators. The widespread use of withheld judgments and inadequate records, as well as general reluctance to convict on a drinking-driving charge at BAC levels below .15%, combined to thwart the intent of drinking-driving laws.

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DOT-HS-4-00958
1978; 87p refs
Rept. for Jun 1974-Jul 1977. Vols. 1-2 are HS-803 468--HS-803 469; vols. 4-6 are HS-803 471--HS-803 473.
Availability: NTIS

HS-803 471

**EVALUATION AND SYSTEM DESCRIPTION OF
ASAP [ALCOHOL SAFETY ACTION PROJECT]
JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY,
MINNESOTA, CASE STUDY. FINAL REPORT**

As one of five case studies of Alcohol Safety Action Projects (ASAP's) which had undergone significant change in the legal or judicial system or had developed innovative approaches for handling drinking-driving cases, this study examined the impact of Minnesota's progressive DWI (driving while intoxicated) legislation which includes a .10% BAC (blood alcohol concentration) as a per se violation, pretest breath testing and implied consent laws, on the adjudication and processing of DWI cases by the Hennepin County Municipal Court. It is concluded that this legislation has had little discernible impact on the adjudication of DWI cases.

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DOT-HS-4-00958
1978; 106p refs
Rept. for Jun 1974-Jul 1977. Vols. 1-3 are HS-803 467--HS-803 470; vols. 5-6 are HS-803 472--HS-803 473.
Availability: NTIS

HS-803 472

**EVALUATION AND SYSTEM DESCRIPTION OF
ASAP [ALCOHOL SAFETY ACTION PROJECT]
JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA
CASE STUDY. FINAL REPORT**

As one of five case studies of Alcohol Safety Action Projects (ASAP's) which had undergone significant change in the legal or judicial system or had developed innovative approaches for handling drinking-driving cases, this study was conducted to document and assess the efforts of the Phoenix ASAP's in-

innovative plea bargaining program intended to deal with a large backlog of court cases and to provide an inducement for DWI (driving while intoxicated) offenders to participate in appropriate alcohol therapy. The innovative program, called the Prosecutor's Alternative to Court Trial (PACT), was designed to provide an expedient, uniform, and fair method of classifying and diverting DWI offenders into a short-term alcohol rehabilitation program with the incentive of earning a plea bargain which avoided a mandatory jail sentence. The PACT concept was found to be effective and transferable to any system requiring a routine, high-volume but discriminating referral mechanism.

Indiana Univ., Inst. for Res. in Public Safety, 400 E. Seventh St., Bloomington, Ind. 47401
DOT-HS-4-00938
1978; 119p refs
Rept. for Jun 1974-Jul 1977. Vols. 1-4 are HS-803 468-HS-803 471; vol. 6 is HS-803 473.
Availability: NTIS

HS-803 473

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT

As one of five case studies of Alcohol Safety Action Projects (ASAP's) which had undergone significant change in the legal or judicial system or had developed innovative approaches for handling drinking-driving cases, this study examined investigation, referral, and monitoring systems for the handling of DWI (driving while intoxicated) cases in the Los Angeles County ASAP. The comparative analysis of the various methods used in the different courts indicated that the quick, inexpensive prearrest screening and referral procedure provided by public health investigation staff in the Los Angeles Downtown Traffic Court was superior, particularly in its efficiency. Services provided by the probation department, which involved extensive investigations, particularly in the Pomona Municipal Court, were inappropriate for DWI screening and referral, but provided effective long-term personal supervision and compliance monitoring. The Van Nuys Municipal Court received participating investigation, referral, and monitoring support from volunteer counselors with the local alcoholism council. The volunteer approach was found to be an efficient, inexpensive procedure despite a high staff turnover rate.

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DOT-HS-4-00938
1978; 119p refs
Rept. for Jun 1974-Jul 1977. Vols. 1-5 are HS-803 468-HS-803 472.
Availability: NTIS

HS-803 520

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE

EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS

Detailed information is presented on defect recall campaigns conducted by domestic and foreign automobile, equipment, and tire manufacturers during the first quarter of 1978. Automobiles, Jeeps, trucks, motor homes, vans, buses, motorcycles, recreational vehicles, motor scooters and mopeds, T-bar roof glass panels, truck engines, safety helmets, auxiliary transmission units, jacks, slide-in campers, aluminum hubs, push-bar controllers, tires, and rims are included.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
Rept. No. PB-287 735/AS; 1978; 807p
Availability: NTIS

HS-803 531

DATA SOURCES TO SUPPORT THE NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] DEFECTS INVESTIGATION SYSTEM. FINAL REPORT

In an effort to determine whether additional information sources would be useful to the National Hwy. Traffic Safety Administration's (NHTSA) Office of Defects Investigation (ODI) in meeting its responsibility for determining whether safety-related motor-vehicle defect exists, and to determine how such data might best be utilized, the present sources of information used by ODI were reviewed, and consideration was given to new sources as well as enhancement of some of the present ones. New sources of information studied included the NHTSA Fatal Accident Reporting System (FARS), crash records, fire department records, a newspaper clipping service, and in-depth accident investigation reports. Analytic methods are presented for processing both the present ODI files and data from the suggested new sources. The accuracy and completeness of the data from the several sources is discussed, and an inventory model of the defect identification and recall process is presented. Seven appendices are included, primarily illustrating characteristics of some information sources and analytical methods appropriate to identify data from such sources. The new sources suggested are believed to be practical, and implementable into the ODI information processing system. The present ODI system has the capacity to handle additional inputs, but it does not have a capability to perform statistical analyses directly. Development of analytic capabilities and of associated computer activities recommended.

by J. O'Day; M. J. Compton; R. J. Kaplan
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109
DOT-HS-7-07604
Rept. No. UM-HSR1-78-14; 1978; 130p 2refs
Rept. for Sep 1977-Mar 1978.
Availability: NTIS

HS-803 533

RESEARCH SAFETY VEHICLE, PHASE 3. STATUS REPORT NO. 9, 1 MAY TO 30 JUNE 1978

The planned testing for Phase 3 of the Research Safety Vehicle (RSV) was completed. The final test of Phase 4 protocol front end showed 34 G's in the occupant compartment, w

unacceptable head injury criteria (HIC) for driver and passenger. Reports were submitted on the handling tests, the air belt restraint system, the second frontal barrier test (No. 9), and the low speed damageability tests (Nos. 1, 2, and 4). Design resolution has been completed except for functional systems (Task 4.7). There was an increase of \$368,000 over estimated costs in the past two months. Static crush tests of the front rail indicated need for further modification, and studies in progress indicate that weight and strength reduction may be possible in the front longitudinal sub-floor reinforcement. Changes are being made in the RSV side structure and in the rear bumper. Design for the instrument and door-trim panels has been completed. Bendix has resolved leakage problems in the brake design. Major weight changes include an added 2.454 kg (5.41 lbs) for the underbody, leading to a total estimated RSV curb weight of 1215.256 kg (2679.64 lbs). The structural model has been modified by separating the radiator element from the engine by two inches. Computer runs indicate that the structural model satisfactorily predicts vehicle performance. Calspan's major effort was in testing the dynamic cars and analyzing the data. Investigation of the restraint systems included a review of sled films of driver air bag evaluation which indicated contact between the lower wheel rim and the dummy torso. The seat and the size of the air bag were changed and tested in further sled tests. Another series of sled tests was made to evaluate the Minicar's passenger air bag. The air belt restraint system did not adequately restrain the dummies in barrier car tests, due to component failure. The final three high speed crash tests of integrated systems were completed. The RSV exhibited excellent side crash and intrusion control with all occupant injury exposure levels well below Federal Motor Vehicle Safety Standard 208 values, and negligible fuel loss. The RSV has demonstrated emissions within the 1978 California standard, and the fuel economy exceeded the 1978 Federal standard of 27.5 mpg.

Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225
DOT-HS-7-01351
Rept. No. ZN-6069-V-22; 1978; 80p refs
Availability: Reference copy only

HS-803 536

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

In response to Section 311(b) of the Motor Vehicle Information and Cost Savings Act (15 USC 1901 et seq.), a study was undertaken for Congress by the National Hwy. Traffic Safety Administration (NHTSA) in order to accomplish the following objectives: to evaluate the diagnostic analysis and test equipment available for use in small automotive repair establishments; to determine the scope of research and development required to make such equipment compatible with state motor vehicle inspection and diagnostic equipment; and to determine the extent to which private industry can supply small garages with low-cost test equipment for monitoring compliance with Federal, state, and local safety, noise, and emission standards. The best available data indicate that small garages located in jurisdictions which now require mandatory periodic inspection of motor vehicles-in-use (VIU) for safety and/or emissions can generally perform the repairs necessary to ensure compliance with the local inspection standards. There are some arguments against extending the inspection capability to small garages.

Not more than 55% of registered vehicles are subject to mandatory periodic motor vehicle inspection (PMVI). VIU safety inspections are designed to be performed with minimal test equipment. Only 4% of vehicles registered in jurisdictions require periodic inspections for both safety and emissions. Although existing emission inspection requirements are not severe, reinspection failure rates average about 25%. Minor but troubling incompatibilities persist among inspection standards, normal vehicle variability, inspection equipment, and test conditions for some of the more mature vehicle systems, involving brake performance, front-end alignment, and headlamp aim. Evaluations and recommendations are presented on the equipment required to support both existing and near-term future VIU compliance inspections for emissions, safety, and noise.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 232p refs
Availability: OPO, stock no. 050-003-00323-9

HS-803 566

OCCUPANT PROTECTION PROGRAM. PROGRESS REPORT, AUGUST 30, 1978 [PASSIVE RESTRAINT SYSTEMS]

This represents the first report on the activities of the Dept. of Transportation (DOT) and on the progress of the automotive industry toward meeting the passive restraint standard issued in Jun 1977 by DOT Secretary Brock Adams. The standard requires that passive restraints be provided beginning in 1982 model full-size cars, in 1983 intermediate and compact cars, and in 1984 subcompacts. Air bags, passive belts, or any other system the manufacturers develop can be used to meet the requirements of the safety performance standard. DOT intends to issue progress reports on passive restraint developments twice yearly until the standard is in effect. The present role of DOT is to assist manufacturers in identifying and analyzing remedies for particularly challenging problems, in assessing the effectiveness and consumer response to particular systems, and in making sure the public is knowledgeable about the systems offered in the marketplace. The status of passive restraint systems is discussed in the following sections: on-the-road experience with passive restraints, 1972-1978; the public (assessment of public attitudes towards passive restraints, public information on passive restraints); industrial preparedness including vehicle manufacturer status, supply industry status, industrial development of passive restraint technology (air bag technology, passive belt technology, and passive restraint marketing strategies); continuing evaluation of crash protection systems; increasing the usage of safety belts (active belts, passive belts, child restraints); and passive restraint product liability.

National Hwy. Traffic Safety Administration, Washington, D.C. 20590
Rept. No. PR-Aug-78; 1978; 31p
Availability: Reference copy only

HS-803 567

PUBLIC ATTITUDES TOWARD PASSIVE RESTRAINT SYSTEMS. SUMMARY REPORT

A scientifically-selected sample of 2016 adult Americans who are either licensed drivers or who live in households with at

least one automobile was interviewed between 17 May and 27 May 1978 in order to obtain their attitudes toward automobile safety (concern about automobile safety and perception of the need to protect automobile passengers from crash injury; attitudes toward currently available safety equipment, particularly the active safety belts; attitudes toward new rules requiring passive restraint systems in new cars for crash protection; public expectations about the technology and use of new passive restraint systems). One major finding is that while the American public expresses considerable concern about the possibility of being injured in an automobile accident, only a quarter of the population report that they use seat belts all or most of the time. By a two-to-one margin, Americans believe that the government should require minimum crash protection in new cars rather than encourage greater seat belt use. The public generally agrees with the Secretary of Transportation's decision to require passive restraints in new automobiles. Air bags are much better known than automatic seat belts. Price is only a marginal consideration in the choice by those surveyed between air bags and automatic belts. The public rates air bags above automatic or active belts for their safety protection, comfort, appearance, and ease of use. The public is generally favorable to government auto safety regulation, and believes that government regulators have the public's interest at heart. Another major finding is that the public believes in regulation of many major industries in order to protect public safety.

Peter D. Hart Res. Associates, Inc.

1978; 13p

Sponsored by National Hwy. Traffic Safety Administration.

Availability: Reference copy only

HS-801 568

RSV (RESEARCH SAFETY VEHICLE) PHASE III. BIMONTHLY PROGRESS REPORT, APRIL/MAY 1978

Design and development engineering progress made on the Minicars RSV (research safety vehicle) Phase III program during the eighth bimonthly reporting period is described. Work done by Minicars is summarized in the following task and subtask sections: product improvement of inflatable restraints (driver restraint system, including static tests of driver's air bag cover, and sled tests of driver's system, the front seats, and their head restraints); structural refinement (weight control and reduction, refine build IV design); systems refinement; braking and handling (braking, ride and handling tests); compatibility analysis; high technology engine/transmission (engine configuration, design of shifting actuator); structures fabrication; large RSV (LRSV) glazing; production planning; tooling; and Phase IIIb long-term items. Appendices contain sled test data and subcontractors' progress reports, including RCA Labs. (electronics), Durbur Computer Systems, Inc. (automation of manual transmissions), Kinetic Res., Inc. (property damage algorithm, and generalized contact point distributions as a function of various impact mode definitions). Also appended is a shaft final report by the Univ. of Wisconsin-Madison on the Minicars auto shift.

Minicars, Inc., 55 Depot Rd., Goshute, Calif. 93017

DOT-HS-7-01552

Rept. No. PR-Ap-Mp-38; 1978; 172p 44cfs

Availability: Corporate author

HS-805 571

MOTORCYCLE SAFETY

This booklet is intended to point out the risks involved and the measures necessary to insure safety in motorcycle operation. Background information on the motorcycle includes number of motorcycle registrations, fatality rates for motorcycle accidents, and crashworthiness of motorcycles vs. automobiles. The causes of motorcycle accidents are considered in terms of special precautions that the motorcyclist must take. Buying the right motorcycle is discussed in terms of fit and functional requirements. Steps to take after buying a motorcycle, but before going out on the road, are outlined (e.g. read owner's manual, attend a motorcycle rider course, buy protective gear). Advice is given on what type of protective clothing and equipment to procure. Driving tips are presented for avoiding offensive driving and using defensive driving techniques. Tips are provided on how to react in certain emergency situations (e.g. throttle stuck, emergency braking). Preventive maintenance tips are suggested, including reference to the owner's manual, and daily visual and operational checks.

National Hwy. Traffic Safety Administration, Washington,

D.C. 20590

1976; 20p

Prepared in cooperation with Motorcycle Safety Foundation, 6755 Elkridge Landing Rd., Linthicum, Md. 21090.

Availability: Corporate author

HS-810 324

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

Odometer fraud is a significant source of consumer complaint in used car transactions, both wholesale and private sales, and a safety hazard when the purchaser cannot determine whether the used car is in a safe operating condition or when preventive maintenance is necessary. Wholesale disposition of fleet vehicles, typically late models with high mileage, is believed to represent an important area of odometer fraud. The annual cost of such fraud to the consumer is estimated at several hundred million dollars. Title IV of the Motor Vehicle Information and Cost Savings Act of 1972 makes it illegal to disconnect or reset an odometer. The law further prohibits advertisement, sale, or use of odometer altering devices, and requires disclosure of mileage information to vehicle purchasers. NHTSA has issued Federal Motor Vehicle Safety Standard (FMVSS) 127 to limit odometer manipulation by making the odometer tamper-resistant. Violators are being apprehended through Federal, state, and private enforcement of regulations. FMVSS 127 requires that an odometer have a distance indicator which cannot be reversed without rendering the odometer inoperable. Alternatively, each numeral of the odometer's 10,000 mile wheel could be permanently marked in its cycle is completed. The Standard also requires a sixth wheel to indicate when a vehicle's mileage has passed 100,000. Future requirements may include a distinctive color for replacement odometers. These requirements will not provide a "tamper-proof" odometer, but will serve to protect the customer by

regulation, which requires each transferee of a vehicle to furnish a statement of the vehicle's mileage and requires distributors and dealers to retain a copy of these statements for four years. The agency views consumer education and participation in enforcement of the odometer laws as very important.

by Joan Claybrook
National Hwy. Traffic Safety Administration, Washington,
D.C. 20590
1978; 11p
Availability: NHTSA

INDEX to ABSTRACTS

ACCIDENTOGENE

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

HS-023 856

ACID

ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS

HS-023 865

RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-CONTROLLED DISCHARGE

HS-024 017

ACTION

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL REPORT

HS-003 466

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT

HS-003 469

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL REPORT

HS-003 470

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY, MINNESOTA, CASE STUDY. FINAL REPORT

HS-003 471

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT

HS-003 472

EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT

HS-003 473

ADD

ADD-ONS REDUCE AIR DRAG (PASSENGER CARS)

HS-023 979

ADVANCES

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

HS-024 014

AUTOTEST ADVANCES

HS-023 962

AERODYNAMIC

AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER

HS-023 832

TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND

HS-023 870

AERODYNAMICS

AERODYNAMICS OF THE MODERN CAR

HS-023 938

AFFECTED

DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE

HS-023 982

AGE

ASSESSMENT OF THE EFFECT ON TRAFFIC ACCIDENTS OF THE LOWERING OF THE LEGAL DRINKING AGE IN ILLINOIS

HS-023 907

DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE

HS-023 982

AGENCY

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)

HS-023 924

AID

DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT

HS-023 929

THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD

HS-023 869

AIR

ADD-ONS REDUCE AIR DRAG (PASSENGER CARS)

HS-023 979

AIR CUSHION RESTRAINT SYSTEMS, A BIBLIOGRAPHY

HS-023 914

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES

HS-024 016

MAZDA'S NEW 3-WAY SYSTEM NEEDS NO AIR/FUEL FEEDBACK

HS-024 081

MECHANICALLY RECHARGEABLE, METAL-AIR BATTERIES FOR AUTOMOTIVE PROPULSION

HS-024 015

STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER

HS-023 947

TECHNICAL ASSESSMENT OF FMVSS 121. AIR BRAKE SYSTEMS

HS-023 939

AIRBAG

SMALL-CAR AIRBAG PERFORMANCE STUDIED

HS-023 849

ALCOHOL

AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
(IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL)

HS-023 834

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT

HS-003 468

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY.
FINAL REPORT

HS-003 469

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL RE-
PORT

HS-003 470

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 4: HENNEPIN COUNTY, MIN-
NESOTA, CASE STUDY. FINAL REPORT

HS-003 471

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE
STUDY. FINAL REPORT

HS-003 472

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 6: LOS ANGELES COUNTY,
CALIFORNIA CASE STUDY. FINAL REPORT

HS-003 473

NEW PROCESS MAKES GASOLINE FROM ALCOHOL

HS-024 006

THE STATUS OF ALCOHOL FUELS UTILIZATION
TECHNOLOGY FOR HIGHWAY TRANSPORTATION

HS-024 009

ALCOHOLICS

A PSYCHOSOCIAL COMPARISON OF DRUNKEN
DRIVERS AND ALCOHOLICS

HS-023 968

ALLOY

LABORATORY EVALUATION OF NEW LOW ALLOY
GEAR STEELS

HS-023 957

ALTERNATE

COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPEN-
DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT

HS-023 904

MTBE BEING EVALUATED AS ALTERNATE FUEL
COMPONENT (METHYL TERTIARY BUTYL ETHER)

HS-023 917

URBAN FUEL ECONOMY: AN ALTERNATE IN-
TERPRETATION OF RECENT COMPUTER SIMULA-
TION CALCULATIONS

ALUMINUM

ADVANCES IN THE DEVELOPMENT OF LITHIUM-
ALUMINUM/METAL SULFIDE CELLS FOR ELEC-
TRIC-VEHICLE BATTERIES

HS-024 004

ANALYSES

STATISTICAL ANALYSES OF COMMERCIAL VEHIC-
LE ACCIDENT FACTORS. VOL. 1, TECHNICAL RE-
PORT. PT. 1. FINAL REPORT

HS-003 418

ANALYTICAL

AN ANALYTICAL AND EXPERIMENTAL STUDY OF
AUTOMOBILE DYNAMICS WITH RANDOM ROAD-
WAY INPUTS

HS-023 971

AN ANALYTICAL STUDY OF TRANSMISSION
MODIFICATIONS AS RELATED TO VEHICLE PER-
FORMANCE AND ECONOMY

HS-023 958

ANGELES

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 6: LOS ANGELES COUNTY,
CALIFORNIA CASE STUDY. FINAL REPORT

HS-003 473

ARIZONA

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE
STUDY. FINAL REPORT

HS-003 472

ARRESTED

MOOD DIFFERENCES OF MEN ARRESTED ONCE
AND MEN ARRESTED TWICE FOR DRIVING WHILE
INTOXICATED

HS-023 909

ART

PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-
THE-ART ANALYSIS AND EVALUATION OF EFFEC-
TIVE SOLUTIONS

HS-023 850

PRELIMINARY POWER TRAIN DESIGN FOR A
STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

ASAP

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT

HS-003 468

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY.
FINAL REPORT

HS-003 469

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL RE-
PORT

HS-003 470

March 31, 1979

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 4: HENNEPIN COUNTY, MIN-
NESOTA, CASE STUDY. FINAL REPORT

HS-803 471

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE
STUDY. FINAL REPORT

HS-803 472

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 6: LOS ANGELES COUNTY,
CALIFORNIA CASE STUDY. FINAL REPORT

HS-803 473

ASCERTAINING

ASCERTAINING THE EFFECTS OF ATMOSPHERIC
FACTORS DURING VISUAL DETECTION EXPERI-
MENTS IN AUTOMOBILE HEADLIGHTING

HS-023 831

ASSEMBLIES

ANALYSIS AND DESIGN OF THREADED ASSEM-
BLIES [MECHANICAL FASTENERS]

HS-024 007

ASSEMBLY

THE DEVELOPMENT OF QUALITY INFORMATION
SYSTEMS IN AUTOMOTIVE ASSEMBLY

HS-023 955

ASSESS

THE EPA PROGRAM TO ASSESS THE PUBLIC
HEALTH SIGNIFICANCE OF DIESEL EMISSIONS
[ENVIRONMENTAL PROTECTION AGENCY]

HS-023 924

ASSESSMENT

ASSESSMENT OF THE EFFECT ON TRAFFIC AC-
CIDENTS OF THE LOWERING OF THE LEGAL
DRINKING AGE IN ILLINOIS

HS-023 907

TECHNICAL ASSESSMENT OF FMVSS 121, AIR
BRAKE SYSTEMS

HS-023 939

ATLANTA

EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY. PROCEEDINGS OF A CONFERENCE
HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1976

HS-023 824

ATMOSPHERIC

ASCERTAINING THE EFFECTS OF ATMOSPHERIC
FACTORS DURING VISUAL DETECTION EXPERI-
MENTS IN AUTOMOBILE HEADLIGHTING

HS-023 831

ATTEMPT

AN ATTEMPT TO CHARACTERIZE TRAFFIC IN
METROPOLITAN AREAS

HS-023 921

ATTITUDES

HEIGHTENED FEAR OF INFLATION UNDERMINES
CONSUMER CONFIDENCE [U.S. ATTITUDES
TOWARDS AUTOMOBILES AND OTHER PURCHASES]
HS-023 993

PUBLIC ATTITUDES TOWARD PASSIVE RESTRAINT
SYSTEMS. SUMMARY REPORT

HS-803 567

AUDI

A WORLDWIDE ROTARY UPDATE, TOYO KOOYO,
AUDI NSU, AND OTHER ROTARY DEVELOPMENTS
[MOST RECENT ROTARY ENGINE DESIGNS]

HS-023 994

AUSTRALIA

A DRIVING CYCLE FOR SYDNEY [DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA]

HS-023 826

AUTOMOBILE

AN ANALYTICAL AND EXPERIMENTAL STUDY OF
AUTOMOBILE DYNAMICS WITH RANDOM ROAD-
WAY INPUTS

HS-023 971

ASCERTAINING THE EFFECTS OF ATMOSPHERIC
FACTORS DURING VISUAL DETECTION EXPERI-
MENTS IN AUTOMOBILE HEADLIGHTING

HS-023 831

COMBINED CYCLE GAS TURBINE FOR AN AUTO-
MOBILE APPLICATION

HS-024 022

LIGHTER, CHEAPER COMPOUNDS WITH GLASS
BUBBLES IN PLASTICS [WEIGHT SAVINGS IN AU-
TOMOBILE PARTS]

HS-024 003

NEW SENSORS FOR AUTOMOBILE ENGINE CON-
TROL

HS-023 976

THE AUTOMOBILE INDUSTRY

HS-023 928

AUTOMOBILES

A DRIVING CYCLE FOR SYDNEY [DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA]

HS-023 826

FUTURE FLASH [CHARACTERISTICS OF U.S. AU-
TOMOBILES IN THE NEXT DECADE]

HS-023 988

HEIGHTENED FEAR OF INFLATION UNDERMINES
CONSUMER CONFIDENCE [U.S. ATTITUDES
TOWARDS AUTOMOBILES AND OTHER PURCHASES]
HS-023 993

THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON
AUTOMOBILES WITH FRONT AND REAR SPOILERS

HS-023 868

AUTOMOTIVE

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION
EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE
HEADLIGHTING

HS-023 942

AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS

HS-023 908

CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION

HS-023 859

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS

HS-023 964

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

HS-003 536

FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS

HS-023 925

INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES

HS-023 927

MECHANICALLY RECHARGEABLE, METAL-AIR BATTERIES FOR AUTOMOTIVE PROPULSION

HS-024 015

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (3.1 LITERS), 4V. INTERIM REPORT

HS-003 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT

HS-003 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-003 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

HS-003 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

HS-003 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

HS-003 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-003 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE

SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), 1V. INTERIM REPORT

HS-003 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT

HS-003 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-003 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT

HS-003 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-003 335

PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER

HS-024 020

TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM

HS-023 855

THE DEVELOPMENT OF QUALITY INFORMATION SYSTEMS IN AUTOMOTIVE ASSEMBLY

HS-023 955

TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE

HS-024 023

AUTOTEST

AUTOTEST ADVANCES

HS-023 962

BASE

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY OR LINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B. DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS

HS-023 964

BATTERIES

ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS

HS-023 865

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

HS-024 014

CHOOSING AND CARING FOR STORAGE BATTERIES

HS-023 992

March 31, 1979

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES
HS-024 016

LITHIUM SILICON - IRON SULFIDE LOAD-LEVEL-
ING AND ELECTRIC VEHICLE BATTERIES
HS-024 013

MECHANICALLY RECHARGEABLE, METAL-AIR
BATTERIES FOR AUTOMOTIVE PROPULSION
HS-024 015

RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-
CONTROLLED DISCHARGE
HS-024 017

BATTERY
A HIGH ENERGY NICKEL-ZINC BATTERY FOR
ELECTRIC VEHICLES
HS-023 863

BATTERY POWERED JEEP AND VAN PER-
FORMANCE
HS-023 866

BEAMS
MORE LIGHT, LESS ELECTRICITY WITH HALOGEN
SEALED-BEAMS (HEADLIGHTS)
HS-024 027

BEARING
SPECIAL STEEL EXTENDS BEARING LIFE
HS-024 000

BEAT
HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 963

BEATTYVILLE
HIGHWAY ACCIDENT REPORT: USTER TRANSPORT,
INC., TRACTOR-CARGO-TANK-SEMITRAILER OVER-
TURN AND FIRE, STATE ROUTE 11, BEATTYVILLE,
KENTUCKY, SEPTEMBER 24, 1977
HS-023 966

BEHAVIOR
DRIVER'S VISIBILITY REQUIREMENTS FOR ROAD-
WAY DELINEATION. VOL. 1: EFFECTS OF CON-
TRAST AND CONFIGURATION ON DRIVER PER-
FORMANCE AND BEHAVIOR. FINAL REPORT
HS-023 852

BELTED
LESSONS FROM THE FIRESTONE FRACAS
(FIRESTONE TIRE AND RUBBER COMPANY'S
STRATEGY IN THE INVESTIGATION OF ITS 590 SE-
RIEN STEEL-BELTED RADIALS)
HS-023 833

BENEFITS
SOME PROBLEMS AND BENEFITS FROM THE
HYDROGEN FUELED SPARK IGNITION ENGINE
HS-024 019

BIAS
DEFORMATION AND CORD TENSION OF A BIAS
TIRE IN CONTACT WITH THE ROAD
HS-023 837

BIBLIOGRAPHY
AIR CUSHION RESTRAINT SYSTEMS, A BIBLIO-
GRAPHY

BIMONTHLY
RSV [RESEARCH SAFETY VEHICLE] PHASE III
BIMONTHLY PROGRESS REPORT, APRIL/MAY 1978
HS-003 368

BOARD
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
[IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL]
HS-023 834

BONDED
BONDED BUS SNAPS TOGETHER
HS-024 002

BOOSTS
USING WASTE HEAT BOOSTS DIESEL EFFICIENCY
HS-023 843

BRAKE
OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT
TO PREDICT [LARGE MINING TRUCKS]
HS-023 998

TECHNICAL ASSESSMENT OF FMVSS 121, AIR
BRAKE SYSTEMS
HS-023 939

BRAKING
BRAKING SAFELY? [NEW ERC (EUROPEAN
ECONOMIC COMMUNITY) BRAKING REGULATIONS,
ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING
SYSTEMS]
HS-024 029

BRAZIL
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
[IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL]
HS-023 834

BRIEF
GAS TURBINES -- A BRIEF REVIEW OF BASIC TYPES
HS-023 963

BRIGHTEN
HEADLIGHT IMPROVEMENTS. BRIGHTEN THE COR-
NERS (AND THE STRAIGHT-AWAYS) WHERE YOU
ARE
HS-023 918

BUBBLES
LIGHTER, CHEAPER COMPOUNDS WITH GLASS
BUBBLES IN PLASTICS [WEIGHT SAVINGS IN AU-
TOMOBILE PARTS]
HS-024 003

BUICK
PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5
LITERS), 4V. INTERIM REPORT
HS-003 327

BURN
FAST BURN-HEAVY BOR IMPROVES ECONOMY,
REDUCES NOX [SHORT COMBUSTION DURATION,
EXHAUST GAS RECIRCULATION REDUCES
NITROGEN OXIDES]

- BUS**
BONDED BUS SNAPS TOGETHER HS-024 002
- BUSES**
TWO-WAY RADIOS PAY OFF FOR TENNESSEE DISTRICT (SCHOOL BUSES) HS-023 978
- BUTYL**
MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT (METHYL TERTIARY BUTYL ETHER) HS-023 917
- CALCULATION**
THE CALCULATION OF THE FLOW FIELD FAST A VAN WITH THE AID OF A PANEL METHOD HS-023 869
- CALCULATIONS**
CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL HS-023 931
URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS HS-023 828
- CALIBRATION**
CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS HS-023 916
- CALIFORNIA**
EVALUATION AND SYSTEM DESCRIPTION OF ASAF (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT HS-803 473
INTERCITY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1 HS-024 008
INTERCITY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2 HS-024 018
INTERCITY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3 HS-024 024
- CAMPAIGNS**
SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS HS-803 529
- CANADA**
USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA HS-024 010
- CAPACITY**
GRADE EFFECTS ON TRAFFIC FLOW STABILITY
- CAR**
AERODYNAMICS OF THE MODERN CAR HS-023 938
FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS HS-023 936
GUIDE TO HIGH SPEED PATROL CAR TIRES HS-023 909
IS YOUR CAR KILLING YOU? OR RATHER, ARE ITS SEATS? HS-024 028
MAPPING MENTAL LOAD IN CAR DRIVING HS-023 986
REVOLUTION IN CAR WIRING HS-023 923
SAFER DRIVING WITH NEW CAR RADAR HS-023 977
SMALL-CAR AIRBAG PERFORMANCE STUDIED HS-023 849
- CARBON**
THE ROLE OF RHODIUM IN RH/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE HS-023 860
- CARBURIZATION**
A PROGRAM FOR PREDICTING AND CONTROLLING CARBURIZATION RESPONSE HS-023 956
- CARGO**
HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977 HS-023 966
- CARING**
CHOOSING AND CARING FOR STORAGE BATTERIES HS-023 992
- CAROLINA**
AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT HS-803 454
- CARRYING**
THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN HS-023 825
- CARS**
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS HS-023 865
ADD-ONS REDUCE AIR DRAG (PASSENGER CARS) HS-023 979
UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS HS-023 863

CASE

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT

HS-803 409

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL REPORT

HS-803 470

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY, MINNESOTA, CASE STUDY. FINAL REPORT

HS-803 471

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT

HS-803 472

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT

HS-803 473

THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES

HS-023 920

CATALYST

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 853

THE ROLE OF RHODIUM IN Rh/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS

HS-023 862

CATALYSTS

CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION

HS-023 839

EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS

HS-023 861

THE ROLE OF RHODIUM IN Rh/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM

HS-023 858

CELLS

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/NITRAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

HS-024 014

PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION

HS-024 012

CELLULOSE

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS [TIRE TREADS]

HS-023 959

CERAMIC

REVOLUTION IN CERAMIC DESIGN [DIKSEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS]

HS-023 919

CHARACTERISTICS

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS [TIRE TREADS]

HS-023 959

FUTURE FLASH [CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE]

HS-023 988

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V, INTERIM REPORT

HS-803 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V, INTERIM REPORT

HS-803 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), P.I. [FUEL INJECTION] INTERIM REPORT

HS-803 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V, INTERIM REPORT

HS-803 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V, INTERIM REPORT

HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V, INTERIM REPORT

HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM, INTERIM REPORT

HS-803 330

SERIES, REPORT NO. 4: 1976 CHEVROLET 45 CID (1.4 LITERS), 1V. INTERIM REPORT

HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 335

PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION

HS-024 012

CHARACTERIZATION

CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION

HS-023 859

CHARACTERIZE

AN ATTEMPT TO CHARACTERIZE TRAFFIC IN METROPOLITAN AREAS

HS-023 921

CHARGE

STRATIFIED CHARGE MIXING STRATEGIES COMPARED

HS-023 845

CHEAPER

LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AUTOMOBILE PARTS)

HS-024 803

CHEVROLET

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 45 CID (1.4 LITERS), 1V. INTERIM REPORT

HS-803 331

STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

CHIPPING

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)

HS-023 959

CHOICE

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

HS-023 851

CHOICES

QUADRUPLEGLIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS

HS-023 941

CHOOSING

CHOOSING AND CARING FOR STORAGE BATTERIES

HS-023 992

CHOPPER

RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-CONTROLLED DISCHARGE

HS-024 017

CID

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT

HS-803 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT

HS-803 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

HS-803 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7

LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 45 CID (1.4 LITERS), IV. INTERIM REPORT

HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), IV. INTERIM REPORT

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), IV. INTERIM REPORT

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-803 335

CLASS

DIESEL TAKEOVER IN CLASS 6 [DIESEL ENGINES IN MEDIUM-DUTY TRUCKS]

HS-023 996

CLAY

A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN

HS-023 944

CLEAN

CLAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]

HS-023 864

CLEARER

DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE

HS-023 982

CLIMATIC

AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER

HS-023 832

COATED

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

HS-023 857

COLT

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SE-

RIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), IV. INTERIM REPORT

HS-803 325

COMBUSTION

CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL

HS-023 951

FAST BURN-HEAVY BGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)

HS-023 846

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE

HS-023 930

PERSPECTS FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS

HS-024 021

STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE

HS-023 949

COMMERCE

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

COMMERCIAL

DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION

HS-023 867

STATISTICAL ANALYSES OF COMMERCIAL VEHICLE ACCIDENT FACTORS. VOL. 1, TECHNICAL REPORT, PT. 1. FINAL REPORT

HS-803 418

COMMITTEE

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

HS-023 857

COMMUNITY

BRAKING SAFELY? [NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS]

HS-024 029

HYBRIDS ELECTRIC VEHICLES IN THE SENGOKU AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)

HS-023 864

OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS

HS-023 970

PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER

HS-024 020

ROAD ACCIDENTS. A COMMUNITY PROBLEM

HS-023 983

COMPANY

LESSONS FROM THE FIRESTONE FRACAS (FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS)

HS-023 833

COMPARED

STRATIFIED CHARCOAL MIXING STRATEGIES COMPARED

HS-023 845

COMPARISON

A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS

HS-023 968

COMPONENT

MTEBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT (METHYL TERTIARY BUTYL ETHER)

HS-023 917

COMPOUNDS

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)

HS-023 939

LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AUTOMOBILE PARTS)

HS-024 003

COMPRESSION

STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER

HS-023 947

COMPUTER

URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

HS-023 828

COMPUTERIZED

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

CONCENTRATION

AN ON-BOARD SENSOR FOR PERCENT ALCOHOL IN-TANK ETILANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL

HS-023 834

CONFERENCE

EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976

HS-023 824

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1

HS-024 000

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2

HS-024 018

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3

HS-024 024

CONFIDENCE

HEIGHTENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE [U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES]

HS-023 993

CONFIGURATION

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. 1: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

CONFLICT

TRAFFIC CONFLICT SURVEYS: SOME STUDY DESIGN CONSIDERATIONS

HS-023 910

CONGESTION

PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS

HS-023 850

SIMULATIONS OF TRAFFIC CONGESTION IN TORONTO

HS-023 827

CONGRESS

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

HS-803 536

CONSEQUENCES

FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS

HS-023 925

CONTACT

DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD

HS-023 837

CONTRAST

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. 1: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

CONTROL

A SCHEME FOR EVALUATING A LOCAL QUEUE WARNING SYSTEM (ANALYSIS OF TRAFFIC CONTROL SYSTEM)

HS-023 922

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

HS-023 851

REC-I plus 1-WAY/REC-II [FORD'S ELECTRONIC ENGINE CONTROL]

HS-023 847

NEW SENSORS FOR AUTOMOBILE ENGINE CONTROL

HS-023 976

THE ROLE OF RHODIUM IN RH/PT (RHODIUM/PLATINUM) CATALYSTS FOR CO/HC/NOX AND SO₂ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM

HS-023 858

CONTROLS

SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY

HS-023 973

CONVECTIVE

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE

HS-023 948

CONVERSIONS

EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS

HS-023 861

CORD

DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD

HS-023 877

CORNERS

HEADLIGHT IMPROVEMENTS BRIGHTEN THE CORNERS (AND THE STRAIGHTAWAYS) WHERE YOU ARE

HS-023 918

CORRELATING

TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM

HS-023 835

CORROSION

CORROSION RESISTANT STEEL AND NONFERROUS MATERIALS FOR METRIC FASTENERS

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

HS-023 857

COST

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A, SITE SELECTION AND DATA COLLECTION. FINAL REPORT

HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT

HS-023 905

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH LIABILITY SHELTER IN SHREDS

HS-023 972

COUNCIL

WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

COUNTY

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY, MINNESOTA, CASE STUDY. FINAL REPORT

HS-803 471

CALIFORNIA CASE STUDY, FINAL REPORT	HS-803 473	AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)	HS-023 864
CRASHES		DEAD	
INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES	HS-023 927	THE ROTARY IS NOT DEAD (WANKEL ENGINE)	HS-024 026
CROSS		DEATHS	
TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND	HS-023 870	WHY MOTORCYCLE DEATHS ARE SOARING	HS-023 990
CRUNCH		DECADE	
TANK TRUCKERS FIGHT INDUSTRY COST-CRUNCH. LIABILITY SHELTER IN SHREDS	HS-023 972	FUTURE FLASH (CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE)	HS-023 988
CURVATURE		DEFECTS	
A NOTE ON TIRE ROLLING RESISTANCE DUE TO TEST WHEEL CURVATURE	HS-023 936	DATA SOURCES TO SUPPORT THE NHTSA (NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION) DEFECTS INVESTIGATION SYSTEM. FINAL REPORT	HS-803 531
CUSHION		DEFORMATION	
AIR CUSHION RESTRAINT SYSTEMS, A BIBLIOGRAPHY	HS-023 914	DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD	HS-023 837
CUT		DELAY	
EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)	HS-023 959	SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY	HS-023 973
OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT (HARVESTING MACHINE, FORKLIFT TRUCK)	HS-023 997	DELINEATION	
CUTTING		COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A, SITE SELECTION AND DATA COLLECTION. FINAL REPORT	HS-023 904
EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)	HS-023 959	COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT	HS-023 839
CYCLE		COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT	HS-023 840
A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)	HS-023 826	COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT	HS-023 841
COMBINED CYCLE GAS TURBINE FOR AN AUTOMOBILE APPLICATION	HS-024 022	COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT	HS-023 842
TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE	HS-024 023	COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6. APPEN-	
CYLINDER			
AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE	HS-023 946		
STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER	HS-023 947		

DICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT

HS-023 905

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. I: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

DELIVERY

ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS

HS-023 865

DEMAND

MOTOR GASOLINE SUPPLY AND DEMAND 1967-1978

HS-023 984

DENIAL

OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS

HS-023 970

DESIGN

A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN

HS-023 944

ANALYSIS AND DESIGN OF THREADED ASSEMBLIES (MECHANICAL FASTENERS)

HS-024 007

DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION

HS-023 867

PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

REVOLUTION IN CERAMIC DESIGN (DIESEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS)

HS-021 919

TRAFFIC CONFLICT SURVEYS: SOME STUDY DESIGN CONSIDERATIONS

HS-021 910

DESIGNS

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS (MOST RECENT ROTARY ENGINE DESIGNS)

HS-023 994

DETAILED

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978 DETAILED REPORTS

HS-803 329

DETECTION

A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING

HS-023 987

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION

ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING

HS-023 831

DEUX

LE DEUX ROUES REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)

HS-023 906

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ÉTUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

HS-023 856

DEVELOPMENTS

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS (MOST RECENT ROTARY ENGINE DESIGNS)

HS-023 994

DEVICES

PERFORMANCE OF HIGHWAY SAFETY DEVICES. FINAL REPORT

HS-023 836

DIAGNOSTIC

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

HS-803 536

DIESEL

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

HS-023 946

CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL

HS-023 951

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE

HS-023 948

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS

HS-023 964

DIESEL PISTON TEMPERATURES MEASURED

HS-023 999

DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)

HS-023 996

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE

HS-023 950

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL

HS-023 953

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND

(1.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 333

REVOLUTION IN CERAMIC DESIGN (DIESEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS)

HS-023 919

STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE

HS-023 949

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)

HS-023 924

USING WASTE HEAT BOOSTS DIESEL EFFICIENCY

HS-023 840

DIFFERENCES

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED

HS-023 969

DIFFICULT

OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT TO PREDICT (LARGE MINING TRUCKS)

HS-023 998

DIRECT

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

HS-023 946

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE

HS-023 948

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL

HS-023 953

DISCHARGE

RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-CONTROLLED DISCHARGE

HS-024 017

DISTRICT

TWO-WAY RADIOS PAY OFF FOR TENNESSEE DISTRICT (SCHOOL BUSES)

HS-023 978

DIVISION

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 33)

HS-023 857

DODGE

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT

HS-803 325

DOUBLE

THE DYNAMIC STABILITY OF PULB-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN

HS-023 825

DRAG

ADD-ONS REDUCE AIR DRAG (PASSENGER CARS)

HS-023 979

THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS

HS-023 868

DREAM

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

HS-023 889

DRESSER

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

DRINKING

ASSESSMENT OF THE EFFECT ON TRAFFIC ACCIDENTS OF THE LOWERING OF THE LEGAL DRINKING AGE IN ILLINOIS

HS-023 903

DRINKING AGE IMPLICATIONS BECOMING CLEARER. THEN DRINKING PATTERNS AFFECTED BY LAW CHANGE

HS-023 982

DRIVE

HOW TO DRIVE. REVISED ED.

HS-023 913

DRIVER

AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORKING PLAN

HS-024 030

DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT

HS-023 929

DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT

HS-803 460

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. 1: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

IS THERE A PLACE FOR THE SIMULATOR IN DRIVER LICENSING? (NEW YORK STUDY)

HS-023 989

THE HANDICAPPED DRIVER'S MOBILITY GUIDE

HS-023 912

DRIVERS

A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS

HS-023 968

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

HS-023 889

OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS

HS-023 970

DRIVING

A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)

HS-023 826

A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING

HS-023 987

LIFE IN THE FAST LANE (FREEWAY DRIVING)

HS-024 004

MAPPING MENTAL LOAD IN CAR DRIVING

HS-023 986

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED

HS-023 969

POLICE LEARN DRIVING SKILLS AT LOW SPEEDS

HS-023 995

SAFER DRIVING WITH NEW CAR RADAR

HS-023 977

WHITEHURST TALKS ABOUT STUDES, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

DRUNKEN

A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS

HS-023 968

OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS

HS-023 970

DURATION

A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)

HS-023 826

FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)

HS-023 846

DUTY

DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)

HS-023 996

DYNAMIC

DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYELIPSE PROJECT

HS-023 943

THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN

HS-023 825

DYNAMICS

AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROADWAY INPUTS

HS-023 971

ECONOMIC

BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)

IIS-024 029

ECONOMY

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 853

AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS

HS-023 908

AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY

HS-023 958

FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)

HS-023 846

URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

HS-023 828

WHENCE THE 1981-84 FUEL ECONOMY STANDARDS?

HS-023 848

EDUCATION

DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT

HS-023 929

EEC

BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)

IIS-024 029

EEC-I plus 3-WAY/EEC-II (FORD'S ELECTRONIC ENGINE CONTROL)

HS-023 847

EFFECTIVE

EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS

IIS-023 952

PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS

HS-023 850

EFFECTIVENESS

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A. SITE SELECTION AND DATA COLLECTION. FINAL REPORT

HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR

RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT

HS-023 905

EFFICIENCY

TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE

HS-024 023

USING WASTE HEAT BOOSTS DIESEL EFFICIENCY

HS-023 843

EGR

FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)

HS-023 846

ELECTRIC

A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC VEHICLE PERFORMANCE DATA

HS-024 011

A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC VEHICLES

HS-023 863

ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS

HS-023 865

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC VEHICLE BATTERIES

HS-024 014

CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SUNBOKU AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)

HS-023 864

DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION

HS-023 867

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES

HS-024 016

LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES

HS-024 013

PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION

HS-024 012

USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA

HS-024 010

ELECTRICITY

MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS (HEADLIGHTS)

HS-024 027

ELECTRONIC

EEC-I plus 3-WAYREC-II (FORD'S ELECTRONIC ENGINE CONTROL)

HS-023 847

ELEMENT

STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD

HS-023 932

EMERGENCY

EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976

HS-023 824

EMISSION

A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)

HS-023 826

THE ROLE OF RHODIUM IN RUPT (RHODIUM/PLATINUM) CATALYSTS FOR CO/HC/NOX AND SO₄ (CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM

HS-023 858

EMISSIONS

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 853

AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS

HS-023 908

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)

HS-023 924

UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS

HS-023 862

March 31, 1979

ENERGY

A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC VEHICLES

HS-023 863

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1

HS-024 008

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2

HS-024 018

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3

HS-024 024

PRODUCT ENERGY IN THE RUBBER INDUSTRY

HS-023 960

PERSPECTIVES FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS

HS-024 021

ENGINE

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS (MOST RECENT ROTARY ENGINE DESIGNS)

HS-023 994

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

HS-023 946

CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL

HS-023 951

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE

HS-023 948

REC-I plus 3-WAY/EEC-II [FORD'S ELECTRONIC ENGINE CONTROL]

HS-023 847

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE

HS-023 950

NEW SENSORS FOR AUTOMOBILE ENGINE CONTROL

HS-023 976

SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED SPARK IGNITION ENGINE

HS-024 019

STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE

HS-023 949

STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER

HS-023 947

THE ROTARY IS NOT DEAD [WANKEL ENGINE]

TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE

HS-024 023

ENGINEERING

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1

HS-024 008

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2

HS-024 018

INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3

HS-024 024

ENGINES

DIESEL TAKEOVER IN CLASS 6 [DIESEL ENGINES IN MEDIUM-DUTY TRUCKS]

HS-023 996

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL

HS-023 953

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT

HS-803 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT

HS-803 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-803 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

HS-803 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS), 2V. INTERIM REPORT

SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), IV. INTERIM REPORT

HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 3: 1977 FORD 140 CID (2.3 LITERS), IV. INTERIM REPORT

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), IV. INTERIM REPORT

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT

HS-803 335

PREDICTION OF SPRAY EVAPORATION IN RECIPROCATING ENGINES

HS-823 954

PERSPECTS FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS

HS-824 021

REVOLUTION IN CERAMIC DESIGN [DIESEL AND GASTURBINE ENGINES AND OTHER APPLICATIONS]

HS-823 919

ENVIRONMENTAL

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS [ENVIRONMENTAL PROTECTION AGENCY]

HS-823 924

EPA

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS [ENVIRONMENTAL PROTECTION AGENCY]

HS-823 924

EQUAL

AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES [HUMAN REACTIONS TO VIBRATION]

HS-823 985

EQUIPMENT

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

HS-803 536

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS

HS-803 529

ESTABLISHMENTS

EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS

HS-803 536

ETHANOL

AN ON-BOARD SENSOR FOR PERCENT ALCOHOL [IN-TANK ETHANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL]

HS-823 834

ETHER

MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT [METHYL TERTIARY BUTYL ETHER]

HS-823 917

ETRANGERE

LE DEUX ROUES REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)

HS-823 906

ETUDE

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

HS-823 856

EUROPEAN

BRAKING SAFELY? [NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS]

HS-824 029

EVALUATED

MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT [METHYL TERTIARY BUTYL ETHER]

HS-823 917

EVALUATION

A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC-VEHICLE PERFORMANCE DATA

HS-824 011

AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORKING PLAN

HS-824 030

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL REPORT

HS-803 468

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT

HS-803 469

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL REPORT

ALCOHOL SAFETY ACTION PROJECT JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY, MINNESOTA, CASE STUDY. FINAL REPORT	HS-803 471	ASSESSMENT OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING	HS-023 942
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT	HS-803 472	EXPERIMENTS ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING	HS-023 831
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT	HS-803 473	EXPLAIN GENERATING HYPOTHESES TO EXPLAIN ACCIDENTS AND OTHER RARE EVENTS	HS-023 935
EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS	HS-803 536	EXTENDS SPECIAL STEEL EXTENDS BEARING LIFE	HS-024 000
LABORATORY EVALUATION OF NEW LOW ALLOY BEAR STEELS	HS-023 957	EYE DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYELLIPSE PROJECT	HS-023 943
PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS	HS-023 850	EYELLIPSE DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYELLIPSE PROJECT	HS-023 943
EVAPORATION PREDICTION OF SPRAY EVAPORATION IN RECIPROCATING ENGINES	HS-023 954	FAST FAST BURN-HEAVY EOR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)	HS-023 846
EXAMINATION AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT	HS-803 454	LIFE IN THE FAST LANE (FREEWAY DRIVING)	HS-024 004
EXECUTIVE COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT	HS-023 839	FASTENERS ANALYSIS AND DESIGN OF THREADED ASSEMBLIES (MECHANICAL FASTENERS)	HS-024 007
EXHAUST CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION	HS-023 839	CORROSION RESISTANT STEEL AND NONFERROUS MATERIALS FOR METRIC FASTENERS	HS-023 967
EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS	HS-023 952	FATAL FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS	HS-023 926
FAST BURN-HEAVY EOR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)	HS-023 846	FATALITIES MOTORCYCLE ACCIDENT FATALITIES	HS-024 005
EXPERIMENTAL AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROADWAY INPUTS	HS-023 971	FEAR HEIGHTENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE (U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES)	HS-023 993
		FEEDBACK MAZDA'S NEW 3-WAY SYSTEM NEEDS NO ATR/FUEL FEEDBACK	HS-024 001

AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER HS-023 832	TECHNICAL ASSESSMENT OF PMVSS 131, AIR BRAKE SYSTEMS HS-023 999
FIBERS EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS [TIRE TREADS] HS-023 929	FORCE TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32) HS-023 857
FIELD THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD HS-023 869	FORCES TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND HS-023 879
FIFTY A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY HS-023 853	FORD ERC-I plus 3-WAY/ERC-II (FORD'S ELECTRONIC ENGINE CONTROL) HS-023 847
FIGHT TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS HS-023 972	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT HS-803 328
FINANCIAL FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS HS-023 925	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT HS-803 329
FINITE STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD HS-023 932	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 3: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT HS-803 332
FIRE HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BRATTVILLE, KENTUCKY, SEPTEMBER 24, 1977 HS-023 966	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT HS-803 334
FIRESTONE LESSONS FROM THE FIRESTONE FRACAS [FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS] HS-023 833	FOREIGN LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE) HS-023 906
FLASH FUTURE FLASH [CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE] HS-023 988	FORKLIFT OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT [HARVESTING MACHINE, FORKLIFT TRUCK] HS-023 997
FLOW EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS HS-023 952 GRADE EFFECTS ON TRAFFIC FLOW STABILITY AND CAPACITY HS-023 838	FRACAS LESSONS FROM THE FIRESTONE FRACAS [FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS] HS-023 833
THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD HS-023 869 THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES HS-023 920	FRANÇAISE LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE) HS-023 906

FRAUD

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

FREEWAY

LIFE IN THE FAST LANE (FREEWAY DRIVING)

HS-024 604

FRENCH

LE DEUX ROUES. REVUE DE LA LITTERATURE FRANCAISE ET ETRANGERE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)

HS-023 906

FREQUENCY

CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS

HS-023 916

FRONT

THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS

HS-023 868

FRONTAL

INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES

HS-021 927

FUEL

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 853

AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS

HS-023 908

AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT

HS-803 454

MAZDA'S NEW 3-WAY SYSTEM NEEDS NO AIR/FUEL FEEDBACK

HS-024 001

MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT (METHYL TERTIARY BUTYL ETHER)

HS-023 917

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-801 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-801 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-803 335

THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN

HS-023 825

TRUCKER'S GUIDE TO FUEL SAVINGS

HS-023 915

URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

HS-023 838

WHENCE THE 1981-84 FUEL ECONOMY STANDARDS?

HS-023 848

FUELED

SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED SPARK IGNITION ENGINE

HS-024 019

FUELS

THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION

HS-024 009

GALLON

GASOLINE: MORE MILES PER GALLON

HS-023 854

60 MPG BY 1985 (MILES PER GALLON, UNITED KINGDOM)

HS-023 933

GAS

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

HS-023 946

COMBINED CYCLE GAS TURBINE FOR AN AUTOMOBILE APPLICATION

HS-024 022

FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)

HS-023 846

GAS TURBINES - A BRIEF REVIEW OF BASIC TYPES

HS-023 963

REVOLUTION IN CERAMIC DESIGN (DIRECT AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS)

HS-023 919

GASEOUS

CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DISH, ENGINE USING A FOUR ZONE MODEL

HS-023 951

GASOLINE

AN ON-BOARD SENSOR FOR PERCENT ALCOHOL (IN-TANK ETHANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL)

HS-023 834

GASOLINE: MORE MILES PER GALLON HS-023 854
MOTOR GASOLINE SUPPLY AND DEMAND 1967-1978 HS-023 984
NEW PROCESS MAKES GASOLINE FROM ALCOHOL HS-024 036

GASOLINES

MOTOR GASOLINES, WINTER 1977-78 HS-023 940

GEAR

LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS HS-023 957

GENERATING

GENERATING HYPOTHESES TO EXPLAIN ACCIDENTS AND OTHER RARE EVENTS HS-023 935

GENERATION

DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYE ELLIPSE PROJECT HS-023 943

GEORGIA

EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976 HS-023 824

GLASS

LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS [WEIGHT SAVINGS IN AUTOMOBILE PARTS] HS-024 003

GRADE

GRADE EFFECTS ON TRAFFIC FLOW STABILITY AND CAPACITY HS-023 838

GROWTH

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS [TIRE THREADS] HS-023 959

GUIDE

GUIDE TO HIGH SPEED PATROL CAR TIRES HS-023 909
THE HANDICAPPED DRIVER'S MOBILITY GUIDE HS-023 912
TRUCKER'S GUIDE TO FUEL SAVINGS HS-023 915

HALOGEN

L.I.F THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL HS-024 025
MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS [HEADLIGHTS] HS-024 027

HANDICAPPED

THE HANDICAPPED DRIVER'S MOBILITY GUIDE HS-023 912
THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT HS-023 911

HARVESTING

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT [HARVESTING MACHINE, FORKLIFT TRUCK] HS-023 997

HC

THE ROLE OF RHODIUM IN RII/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE HS-023 860

HEAD

RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT HS-023 823

HEADLIGHT

HEADLIGHT IMPROVEMENTS. BRIGHTEN THE CORNERS (AND THE STRAIGHTAWAYS) WHERE YOU ARE HS-023 918
L.E.T THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL HS-024 025

HEADLIGHTING

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING HS-023 942
ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING HS-023 831

HEADLIGHTS

MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS [HEADLIGHTS] HS-024 027

HEALTH

THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS [ENVIRONMENTAL PROTECTION AGENCY] HS-023 924

HEAT

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE HS-023 948
USING WASTE HEAT BOOSTS DIESEL EFFICIENCY HS-023 843

HEAVY

FAST BURN-HEAVY BGR IMPROVES ECONOMY, REDUCES NOX [SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES] HS-023 846

HEIGHTENED

HEIGHTENED FEAR OF INFLATION UNDERMINES
CONSUMER CONFIDENCE (U.S. ATTITUDES
TOWARDS AUTOMOBILES AND OTHER PURCHASES)
HS-023 993

HELD

EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY. PROCEEDINGS OF A CONFERENCE
HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1976
HS-023 824

HELPING

HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 961

HENNEPIN

EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 4: HENNEPIN COUNTY, MIN-
NESOTA, CASE STUDY. FINAL REPORT
HS-803 471

HIGH

A HIGH ENERGY NICKEL-ZINC BATTERY FOR
ELECTRIC VEHICLES
HS-023 863

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN
A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE
HS-023 948

GUIDE TO HIGH SPEED PATROL CAR TIRES
HS-023 909

TOWARD A HIGH EFFICIENCY RANKINE CYCLE
AUTOMOTIVE ENGINE
HS-024 023

HIGHWAY

DATA SOURCES TO SUPPORT THE NHTSA
(NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS-
TRATION) DEFECTS INVESTIGATION SYSTEM.
FINAL REPORT
HS-801 531

HIGHWAY ACCIDENT REPORT. USHER TRANSPORT,
INC., TRACTOR-CAROT-TANK-SUMTRAILER OVER-
TURN AND FIRE, STATE ROUTE 11, BEATTYVILLE,
KENTUCKY, SEPTEMBER 24, 1977
HS-023 966

OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT
TO PREDICT [LARGE MINING TRUCKS]
HS-023 998

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT
(HARVESTING MACHINE, FORKLIFT TRUCK)
HS-023 997

PERFORMANCE OF HIGHWAY SAFETY DEVICES.
FINAL REPORT
HS-023 830

THE STATUS OF ALCOHOL FUELS UTILIZATION
TECHNOLOGY FOR HIGHWAY TRANSPORTATION
HS-024 009

HIGHWAYS

COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3 APPEN-

DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT
HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE
SUMMARY. FINAL REPORT
HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL RE-
PORT
HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX
B. DEVELOPMENT AND DESCRIPTION OF COMPU-
TERIZED DATA BASE. FINAL REPORT
HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX
C. STATISTICAL MODEL DEVELOPMENT
HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 6: APPEN-
DICES D AND E. COST OF ROADWAY ACCIDENTS
AND COST AND SERVICE LIFE OF ROADWAY
DELINEATION TREATMENTS. FINAL REPORT
HS-023 905

TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT
(INDIANA HIGHWAYS)
HS-023 974

HUMAN

AN EQUAL SENSATION STUDY OF SEATED SUB-
JECTS IN THREE TRANSLATIONAL MODES (HUMAN
REACTIONS TO VIBRATION)
HS-023 985

RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT
HS-023 823

HYDRAULIC

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT
(HARVESTING MACHINE, FORKLIFT TRUCK)
HS-023 997

HYDROCARBON

THE ROLE OF RHODIUM IN RUTHENIUM
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE
HS-023 860

HYDROGEN

PROGRESS REPORT ON HYDROGEN PRODUCTION
AND UTILIZATION FOR COMMUNITY AND AU-
TOMOTIVE POWER
HS-024 020

SOME PROBLEMS AND BENEFITS FROM THE
HYDROGEN FUELED SPARK IGNITION ENGINE
HS-024 019

HYPOTHESES GENERATING HYPOTHESES TO EXPLAIN ACCIDENTS AND OTHER RARE EVENTS	HS-023 935	INDIANA TRAFFIC SPEED REPORT NO. 105, INTERIM REPORT [INDIANA HIGHWAYS]	HS-023 974
IDAHO EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS, VOL. 3: IDAHO CASE STUDY, FINAL REPORT	HS-023 470	INDIVIDUAL TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM	HS-023 835
IGNITION SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED SPARK IGNITION ENGINE	HS-024 019	INDUSTRY HOW THE TRUCKING INDUSTRY IS PROMOTING THE 55 M.P.H. SPEED LIMIT	HS-023 990
STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER	HS-023 947	PRODUCT ENERGY IN THE RUBBER INDUSTRY	HS-023 960
TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM	HS-023 835	TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH, LIABILITY SHELTER IN SHREDS	HS-023 972
ILLINOIS ASSESSMENT OF THE EFFECT ON TRAFFIC ACCIDENTS OF THE LOWERING OF THE LEGAL DRINKING AGE IN ILLINOIS	HS-023 907	THE AUTOMOBILE INDUSTRY	HS-023 928
IMPACT AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM, WORKING PLAN	HS-024 030	INFLATION HEIGHTENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE [U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES]	HS-023 993
RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT	HS-023 823	INFORMATION STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978	HS-810 324
IMPLICATIONS DRINKING AGE IMPLICATIONS BECOMING CLEARER, TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE	HS-023 982	THE DEVELOPMENT OF QUALITY INFORMATION SYSTEMS IN AUTOMOTIVE ASSEMBLY	HS-023 935
QUADRIPLEGIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS	HS-023 941	INJECTION AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE	HS-023 946
IMPROVEMENT AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM, WORKING PLAN	HS-024 030	CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE	HS-023 948
IMPROVEMENTS HEADLIGHT IMPROVEMENTS, BRIGHTEN THE CORNERS (AND THE STRAIGHTAWAYS) WHERE YOU ARE	HS-023 918	INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL	HS-023 953
IMPROVES FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)	HS-023 846	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT	HS-803 326
		PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT	HS-803 333

- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-003 335
- INJURIES**
FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS
HS-023 926
FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS
HS-023 925
INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES
HS-023 927
QUADRIPLEGIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS
HS-023 941
- INJURY**
INJURY SCALING RESEARCH. FINAL REPORT
HS-003 452
- INLET**
EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS
HS-023 952
- INPUTS**
AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROADWAY INPUTS
HS-023 971
- INSPECTION**
THE STATUS OF MANDATORY PMVI (PERIODIC MOTOR VEHICLE INSPECTION): THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT
HS-023 980
- INTERACTION**
INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL
HS-023 953
- INTERIM**
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT
HS-003 324
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT
HS-003 325
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-003 326
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT
HS-003 327
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT
HS-003 328
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT
HS-003 329
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT
HS-003 330
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), IV. INTERIM REPORT
HS-003 331
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT
HS-003 332
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-003 333
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT
HS-003 334
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-003 335
TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT (INDIANA HIGHWAYS)
HS-023 974
- INTERIOR**
A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN
HS-023 944
- INTERNAL**
PROSPECTS FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS
HS-024 021
- INTERPRETATION**
URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

INTERSECTION

MODELLING AN OVERSATURATED INTERSECTION
HS-023 829

THE SAFETY OF TWO-WHEELED VEHICLES: A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES: ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)
HS-023 856

INTERSOCIETY

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 1
HS-024 008

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 2
HS-024 018

INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE (13TH) PROCEEDINGS, SAN DIEGO, CALIFORNIA, AUGUST 20-25, 1978. VOL. 3
HS-024 024

INTOXICATED

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED
HS-023 969

INVESTIGATING

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE
HS-023 950

INVESTIGATION

A NEW METHOD OF INVESTIGATION OF SWIRL PORTS
HS-023 945

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE
HS-023 946

DATA SOURCES TO SUPPORT THE NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] OBJECTS INVESTIGATION SYSTEM. FINAL REPORT
HS-803 131

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL
HS-023 953

LESSONS FROM THE FIRESTONE FRACAS [FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS]
HS-023 833

IRON

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES
HS-024 016

LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-024 013

TASK FORCE ON UNDERVEHICLE CORROSION OR COATED STEELS (SAB-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)
HS-023 85-

JAPAN

CLEAN TRANSPORTATION FOR NEW TOWNS: DAIHATSU ELECTRIC VEHICLES IN THE SENROKI AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]
HS-023 864

JEEP

BATTERY POWERED JEEP AND VAN PERFORMANCE
HS-023 866

JETS

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL
HS-023 953

JUDICIAL

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL REPORT
HS-803 468

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT
HS-803 469

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL REPORT
HS-803 470

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 4: HENNEPIN COUNTY, MINNESOTA, CASE STUDY. FINAL REPORT
HS-803 471

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT
HS-803 472

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT
HS-803 473

KENTUCKY

HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977
HS-023 966

KILLING

IS YOUR CAR KILLING YOU? OR RATHER, ARE ITS SEATS?
HS-024 025

- KINETIC**
THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES
HS-023 920
- KINGDOM**
60 MPG BY 1985 (MILES PER GALLON, UNITED KINGDOM)
HS-023 933
- KOGYO**
A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS (MOST RECENT ROTARY ENGINE DESIGNS)
HS-023 994
- LABORATORY**
LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS
HS-023 957
- LANE**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3: APPENDIX A. SITE SELECTION AND DATA COLLECTION. FINAL REPORT
HS-023 904
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT
HS-023 839
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT
HS-023 840
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B. DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT
HS-023 841
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C. STATISTICAL MODEL DEVELOPMENT
HS-023 842
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E. COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT
HS-023 905
LIFE IN THE FAST LANE (FREEWAY DRIVING)
HS-024 004
- LARGE**
OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT TO PREDICT (LARGE MINING TRUCKS)
HS-023 998
- LAST**
LET THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL
HS-024 025
- LATERAL**
MEASURING THE LATERAL POSITION OF VEHICLES ON THE ROAD: SYSTEM AND PRELIMINARY RESULTS
HS-023 930
- LAW**
DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE
HS-023 982
- LEAD**
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 865
RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER-CONTROLLED DISCHARGE
HS-024 017
- LEARN**
POLICE LEARN DRIVING SKILLS AT LOW SPEEDS
HS-023 995
- LEGAL**
ASSESSMENT OF THE EFFECT ON TRAFFIC ACCIDENTS OF THE LOWERING OF THE LEGAL DRINKING AGE IN ILLINOIS
HS-023 907
LET THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL
HS-024 025
- LENGTH**
AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS
HS-023 908
- LESS**
MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS (HEADLIGHTS)
HS-024 027
- LESSONS**
LESSONS FROM THE FIRESTONE FRACAS (FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS)
HS-023 833
- LET**
LET THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL
HS-024 025
- LEVELING**
LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-024 013
- LIABILITY**
TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS
HS-023 972

- INTERIM REPORT, F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 989
- LIFE**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS, VOL. 6, APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS, FINAL REPORT
HS-023 905
LIFE IN THE FAST LANE (FREEWAY DRIVING)
HS-024 004
SPECIAL STEEL EXTENDS BEARING LIFE
HS-024 000
- LIFT**
THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS
HS-023 868
- LIGHT**
DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS
HS-021 964
LET THERE BE LIGHT. AT LAST, A HALOGEN HEADLIGHT THAT'S LEGAL
HS-024 025
MORE LIGHT, LESS ELECTRICITY WITH HALOGEN SEALED-BEAMS (HEADLIGHTS)
HS-024 027
- LIGHTER**
LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AUTOMOBILE PARTS)
HS-024 003
- LIMIT**
AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA, FINAL REPORT
HS-803 454
HOW THE TRUCKING INDUSTRY IS PROMOTING THE 55 M.P.H. SPEED LIMIT
HS-023 990
- LITERATURE**
LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)
HS-023 906
- LITERS**
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (0.8 LITERS), 4V. INTERIM REPORT
HS-803 324
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (0.8 LITERS), 2V. INTERIM REPORT
HS-803 325
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.3 LITERS), 4V. INTERIM REPORT
HS-803 321
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.4 LITERS), 2V. INTERIM REPORT
HS-803 328
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT
HS-803 329
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.1 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT
HS-803 330
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (0.4 LITERS), 1V. INTERIM REPORT
HS-803 331
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.1 LITERS), 2V. INTERIM REPORT
HS-803 332
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 333
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT
HS-803 334
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 335
- LITHIUM**
ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES
HS-024 014
LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-024 013
- LITERATURE**
LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)
HS-023 906

March 31, 1979

CLRS. A REVIEW OF FRENCH AND FOREIGN
LITERATURE)

HS-023 906

LOAD

LITHIUM SILICON - IRON SULPHUR LOAD-LEVEL-
ING AND ELECTRIC VEHICLE BATTERIES

HS-024 013

MAPPING MENTAL LOAD IN CAR DRIVING

HS-023 986

STRESS ANALYSIS OF A TIRE UNDER VERTICAL
LOAD BY A FINITE ELEMENT METHOD

HS-023 932

LOCAL

A SCHEME FOR EVALUATING A LOCAL QUEUE
WARNING SYSTEM (ANALYSIS OF TRAFFIC CON-
TROL SYSTEM)

HS-023 922

LOOP

SYNCHRONOUS TIMING LOOP CONTROLS
WINDSHIELD WIPER DELAY

HS-023 973

LOW

LABORATORY EVALUATION OF NEW LOW ALLOY
GEAR STEELS

HS-023 957

POLICE LEARN DRIVING SKILLS AT LOW SPEEDS

HS-023 995

LOWERED

AN EXAMINATION OF THE EFFECTS OF THE
LOWERED MAXIMUM SPEED LIMIT AND FUEL
SHORTAGES IN NORTH CAROLINA. FINAL REPORT

HS-803 454

LOWERING

ASSESSMENT OF THE EFFECT ON TRAFFIC AC-
CIDENTS OF THE LOWERING OF THE LEGAL
DRINKING AGE IN ILLINOIS

HS-023 907

MACHINE

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT
[HARVESTING MACHINE, FORKLIFT TRUCK]

HS-023 997

MAKES

NEW PROCESS MAKES GASOLINE FROM ALCOHOL

HS-024 006

MANDATORY

THE STATUS OF MANDATORY PMVI (PERIODIC
MOTOR VEHICLE INSPECTION) TITINGS AREN'T
GETTING BETTER. OUR 18TH ANNUAL REPORT

HS-023 980

MANUFACTURERS

QUADRIPLEGIA AND OTHER MOTOR VEHICLE IN-
JURIES: SOME IMPLICATIONS AND CHOICES FOR
MOTOR VEHICLE MANUFACTURERS

HS-023 941

MAPPING

MAPPING MENTAL LOAD IN CAR DRIVING

MATERIALS

CORROSION RESISTANT STEEL AND NONFERROUS
MATERIALS FOR METRIC FASTENERS

HS-023 967

MAXIMUM

AN EXAMINATION OF THE EFFECTS OF THE
LOWERED MAXIMUM SPEED LIMIT AND FUEL
SHORTAGES IN NORTH CAROLINA. FINAL REPORT

HS-803 454

MAZDA

MAZDA'S NEW 3-WAY SYSTEM NEEDS NO
AIR/FUEL FEEDBACK

HS-024 001

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID
(1.1 LITERS), 4V. INTERIM REPORT

HS-803 324

MEANS

INVESTIGATING DIESEL ENGINE COMBUSTION BY
MEANS OF A TIMED SAMPLING VALVE

HS-023 950

MEASURED

DIESEL PISTON TEMPERATURES MEASURED

HS-023 999

MEASUREMENT

CALIBRATION FREQUENCY FOR SKID MEASURE-
MENT SYSTEMS

HS-023 916

MEASURING

A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF
VEHICLE DESIGN

HS-023 944

MEASURING THE LATERAL POSITION OF VEHIC-
LES ON THE ROAD. SYSTEM AND PRELIMINARY
RESULTS

HS-023 930

MECHANICAL

ANALYSIS AND DESIGN OF THREADED ASSEM-
BLIES [MECHANICAL FASTENERS]

HS-024 007

MECHANICALLY

MECHANICALLY RECHARGEABLE, METAL-AIR
BATTERIES FOR AUTOMOTIVE PROPULSION

HS-024 015

MEDICAL

EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY. PROCEEDINGS OF A CONFERENCE
HOLD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1976

HS-023 924

MEDIUM

DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES
IN MEDIUM-DUTY TRUCKS)

HS-023 996

- MEN**
MOOD DIFFERENCES OF MEN ARRESTED ONCE
AND MEN ARRESTED TWICE FOR DRIVING WHILE
INTOXICATED
HS-023 969
- MENTAL**
MAPPING MENTAL LOAD IN CAR DRIVING
HS-023 986
- METAL**
ADVANCES IN THE DEVELOPMENT OF LITHIUM-
ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES
HS-024 014
EFFECT OF SUPPORT ON NOBLE METAL
CATALYSTS FOR THREE-WAY CONVERSIONS
HS-023 861
MECHANICALLY RECHARGEABLE, METAL-AIR
BATTERIES FOR AUTOMOTIVE PROPULSION
HS-024 015
- METHOD**
A NEW METHOD OF INVESTIGATION OF SWIRL
PORTS
HS-023 945
STRESS ANALYSIS OF A TIRE UNDER VERTICAL
LOAD BY A FINITE ELEMENT METHOD
HS-023 932
THE CALCULATION OF THE FLOW FIELD PAST A
VAN WITH THE AID OF A PANEL METHOD
HS-023 869
- METHODOLOGY**
EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY, PROCEEDINGS OF A CONFERENCE
HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1976
HS-023 824
- METHYL**
MTBE BEING EVALUATED AS ALTERNATE FUEL
COMPONENT (METHYL TERTIARY BUTYL ETHER)
HS-023 917
- METRIC**
CORROSION RESISTANT STEEL AND NONFERROUS
MATERIALS FOR METRIC FASTENERS
HS-023 967
- METROPOLITAN**
AN ATTEMPT TO CHARACTERIZE TRAFFIC IN
METROPOLITAN AREAS
HS-023 921
- MICHIGAN**
THE DYNAMIC STABILITY OF FUEL-CARRYING
DOUBLE-TANKER TRUCKS IN MICHIGAN
HS-023 825
- MILES**
GASOLINE: MORE MILES PER GALLON
HS-023 854
60 MPG BY 1985 (MILES PER GALLON, UNITED
KINGDOM)
HS-023 933
- MILK**
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID
BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 863
- MINING**
OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT
TO PREDICT (LARGE MINING TRUCKS)
HS-023 998
- MINNESOTA**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
(ALCOHOL SAFETY ACTION PROJECT) JUDICIAL
SYSTEMS. VOL. 4: HENNEPIN COUNTY, MIN-
NESOTA, CASE STUDY. FINAL REPORT
HS-003 471
- MIXING**
STRATIFIED CHARGE MIXING STRATEGIES COM-
PARED
HS-023 845
- MIXTURES**
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
(IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL)
HS-023 834
- MOBILITY**
THE HANDICAPPED DRIVER'S MOBILITY GUIDE
HS-023 912
- MODEL**
A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF
VEHICLE DESIGN
HS-023 944
CALCULATIONS OF GASEOUS PRODUCTS DURING
COMBUSTION IN A DIESEL ENGINE USING A FOUR
ZONE MODEL
HS-023 951
CLEAN TRANSPORTATION FOR NEW TOWNS.
DAIHATSU ELECTRIC VEHICLES IN THE SINKOKU
AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)
HS-023 864
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 5. APPENDIX
C. STATISTICAL MODEL DEVELOPMENT
HS-023 842
INVESTIGATION OF INTERACTION BETWEEN
SWIRL AND JETS IN DIRECT INJECTION DIESEL EN-
GINES USING A WATER MODEL
HS-023 953
RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT
HS-023 823
- MODELLING**
MODELLING AN OVERSATURATED INTERSECTION
HS-023 829
- MODELS**
TRANSIENT AERODYNAMIC FORCES AND MO-
MENTS ON MODELS OF VEHICLES PASSING
THROUGH CROSS-WIND
HS-023 870

MODERN

AERODYNAMICS OF THE MODERN CAR

HS-023 938

MODES

AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES (HUMAN REACTIONS TO VIBRATION)

HS-023 985

MODIFICATIONS

AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY

HS-023 958

MOMENTS

TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND

HS-023 870

MONOXIDETHE ROLE OF RHODIUM IN Rh/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

MOOD

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED

HS-023 969

MOTION

AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE

HS-023 946

STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER

HS-023 947

MOTOR

MOTOR GASOLINE SUPPLY AND DEMAND 1967-1978

HS-023 984

MOTOR GASOLINES. WINTER 1977-78

HS-023 940

QUADRUPLE AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS

HS-023 941

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS

HS-003 529

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

THE STATUS OF MANDATORY PMVI (PERIODIC MOTOR VEHICLE INSPECTION): THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT

HS-023 980

MOTORCYCLE

MOTORCYCLE ACCIDENT FATALITIES

HS-024 005

MOTORCYCLE SAFETY

HS-803 371

WHY MOTORCYCLE DEATHS ARE SOARING

HS-023 991

1978 MOTORCYCLE STATISTICAL ANNUAL

HS-023 975

MPG

60 MPG BY 1985 (MILES PER GALLON, UNITED KINGDOM)

HS-023 933

MTBE

MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT [METHYL TERTIARY BUTYL ETHER]

HS-023 917

MULTIFUNCTIONAL

CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION

HS-023 859

NATIONAL

DATA SOURCES TO SUPPORT THE NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] DEFECTS INVESTIGATION SYSTEM. FINAL REPORT

HS-803 531

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT

HS-023 911

WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

NECK

RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT

HS-023 823

NEEDS

MAZDA'S NEW 3-WAY SYSTEM NEEDS NO AIR/FUEL FEEDBACK

HS-024 001

NEXT

FUTURE FLASH (CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE)

HS-023 988

DATA SOURCES TO SUPPORT THE NHISA
[NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS-
TRATION] DEFECTS INVESTIGATION SYSTEM.
FINAL REPORT

HS-803 531

NICKEL

A HIGH ENERGY NICKEL-ZINC BATTERY FOR
ELECTRIC VEHICLES

HS-023 863

NISSAN

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID
(3.2 LITERS), P.I. (FUEL INJECTION) INTRIM RE-
PORT.

HS-803 133

NITROGEN

FAST BURN-HEAVY EGR IMPROVES ECONOMY,
REDUCES NOX (SHORT COMBUSTION DURATION,
EXHAUST GAS RECIRCULATION REDUCES
NITROGEN OXIDES)

HS-023 846

THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

NOBLE

EFFECT OF SUPPORT ON NOBLE METAL
CATALYSTS FOR THREE-WAY CONVERSIONS

HS-023 861

NOISE

A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF
VEHICLE DESIGN

HS-023 944

OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT
[HARVESTING MACHINE, FORKLIFT TRUCK]

HS-023 997

STOCHASTIC COMBUSTION AND DIESEL ENGINE
NOISE

HS-023 949

TECHNIQUE FOR CORRELATING RADIATED NOISE
WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMO-
TIVE IGNITION SYSTEM

HS-023 835

NONFERROUS

CORROSION RESISTANT STEEL AND NONFERROUS
MATERIALS FOR METRIC FASTENERS

HS-023 967

NONNEGLECTIBLE

THE KINETIC THEORY OF TRAFFIC FLOW IN THE
CASE OF A NONNEGLECTIBLE NUMBER OF QUEUE-
ING VEHICLES

HS-023 920

A NOTE ON TIRE ROLLING RESISTANCE DUE TO
TEST WHEEL CURVATURE

HS-023 936

NOX

FAST BURN-HEAVY EGR IMPROVES ECONOMY,
REDUCES NOX (SHORT COMBUSTION DURATION,
EXHAUST GAS RECIRCULATION REDUCES
NITROGEN OXIDES)

HS-023 846

THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

NSU

A WORLDWIDE ROTARY UPDATE. TOYO KOJOYO,
AUDI NSU, AND OTHER ROTARY DEVELOPMENTS
[MOST RECENT ROTARY ENGINE DESIGNS]

HS-023 994

NUMBER

THE KINETIC THEORY OF TRAFFIC FLOW IN THE
CASE OF A NONNEGLECTIBLE NUMBER OF QUEUE-
ING VEHICLES

HS-023 920

OBSTACLE

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION
EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE
HEADLIGHTING

HS-023 942

OBSTACLES

A VALIDATION OF SUBSIDIARY REACTION TIME
AGAINST DETECTION OF ROADSIDE OBSTACLES
DURING PROLONGED DRIVING

HS-023 987

OCCUPANT

OCCUPANT PROTECTION PROGRAM. PROGRESS RE-
PORT, AUGUST 30, 1978 [PASSIVE RESTRAINT
SYSTEMS]

HS-803 566

OCCUPANTS

FATAL INJURIES TO RESTRAINED PASSENGER CAR
OCCUPANTS

HS-023 926

ODOMETER

STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 124

ONCE

MOOD DIFFERENCES OF MEN ARRESTED ONCE
AND MEN ARRESTED TWICE FOR DRIVING WHILE
INTOXICATED

HS-023 969

OPERATING ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS HS-023 865	PASSENGER ADD-ONS REDUCE AIR DRAG (PASSENGER CARS) HS-023 979
ORIGINS THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS HS-023 868	FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS HS-023 926
OVERCOMING OVERCOMING DENIAL: CHANGING THE SELF-CONCEPTS OF DRUNKEN DRIVERS HS-023 970	PASSENGERS INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES HS-023 927
OVERSATURATED MODELING AN OVERSATURATED INTERSECTION HS-023 829	PASSING TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND HS-023 870
OVERTURN HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977 HS-023 966	PASSIVE OCCUPANT PROTECTION PROGRAM. PROGRESS REPORT, AUGUST 30, 1978 (PASSIVE RESTRAINT SYSTEMS) HS-003 566
OXIDES FAST BURN-HEAVY EGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES) HS-023 846	PUBLIC ATTITUDES TOWARD PASSIVE RESTRAINT SYSTEMS. SUMMARY REPORT HS-003 567
THE ROLE OF RHODIUM IN RH/PT (RHODIUM/PLATINUM) CATALYSTS FOR CO/HC/NOX AND SO4 (CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE HS-023 860	PATROL GUIDE TO HIGH SPEED PATROL CAR TIRES HS-023 909
THE ROLE OF RHODIUM IN RH/PT (RHODIUM/PLATINUM) CATALYSTS FOR CO/HC/NOX AND SO4 (CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE HS-023 860	PATTERNS DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE HS-023 982
THE ROLE OF RHODIUM IN RH/PT (RHODIUM/PLATINUM) CATALYSTS FOR CO/HC/NOX AND SO4 (CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE HS-023 860	PAY TWO-WAY RADIOS PAY OFF FOR TENNESSEE DISTRICT (SCHOOL BUSES) HS-023 978
PANACEA CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA? HS-023 851	PEAK PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS HS-023 850
PANEL THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD HS-023 869	PEOPLE THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT HS-023 911
PART THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM HS-023 858	PERFORMANCE A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC-VEHICLE PERFORMANCE DATA HS-024 011
	AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY HS-023 958

BATTERY POWERED JEEP AND VAN PERFORMANCE

HS-023 866

DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT

HS-003 460

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. 1: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULTY TO PREDICT [LARGE MINING TRUCKS]

HS-023 998

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT

HS-003 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT

HS-003 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-003 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

HS-003 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

HS-003 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

HS-003 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-003 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), 1V. INTERIM REPORT

HS-003 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT

HS-003 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID

0.2 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-003 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT

HS-003 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT

HS-003 335

PERFORMANCE OF HIGHWAY SAFETY DEVICES. FINAL REPORT

HS-023 830

SMALL-CAR AIRBAG PERFORMANCE STUDIED

HS-023 869

THE ROLE OF RHODIUM IN RUPPT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

PERIOD

PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS

HS-023 850

PERIODIC

THE STATUS OF MANDATORY PMVI [PERIODIC MOTOR VEHICLE INSPECTION]: THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT

HS-023 980

PHOENIX

EVALUATION AND SYSTEM DESCRIPTION OF ASAP [ALCOHOL SAFETY ACTION PROJECT] JUDICIAL SYSTEMS. VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT

HS-003 472

PIPE

CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?

HS-023 851

PISTON

DIRECT PISTON TEMPERATURES MEASURED

HS-023 999

EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS

HS-023 952

PLACE

IS THERE A PLACE FOR THE SIMULATOR IN DRIVER LICENSING? [NEW YORK STUDY]

HS-023 989

PLAN

AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORK-ING PLAN

HS-024 030

March 31, 1979

PLANTS

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE
DIESEL POWER PLANTS

HS-023 964

PLASTICS

LIGHTER, CHEAPER COMPOUNDS WITH GLASS
BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AU-
TOMOBILE PARTS)

HS-024 003

PLATINUM

THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/H₂CO AND SO₂ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE

HS-023 860

PMVI

THE STATUS OF MANDATORY PMVI (PERIODIC
MOTOR VEHICLE INSPECTION); THINGS AREN'T
GETTING BETTER. OUR 18TH ANNUAL REPORT

HS-023 980

POLICE

POLICE LEARN DRIVING SKILLS AT LOW SPEEDS

HS-023 993

PORTS

A NEW METHOD OF INVESTIGATION OF SWIRL
PORTS

HS-023 945

EFFECTIVE FLOW AREA OF PISTON CONTROLLED
EXHAUST AND INLET PORTS

HS-023 952

POSITION

MEASURING THE LATERAL POSITION OF VEHIC-
LES ON THE ROAD: SYSTEM AND PRELIMINARY
RESULTS

HS-023 930

POSITIONS

DYNAMIC EYE POSITIONS BY VEHICLE TYPE.
FINAL REPORT OF THE SECOND GENERATION
EYELIKE PROJECT

HS-023 943

POTENTIAL

DRIVER PERFORMANCE TESTS: THEIR ROLE AND
POTENTIAL. FINAL REPORT

HS-803 460

POWER

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE
DIESEL POWER PLANTS

HS-023 964

PRELIMINARY POWER TRAIN DESIGN FOR A
STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

PROGRESS REPORT ON HYDROGEN PRODUCTION
AND UTILIZATION FOR COMMUNITY AND AU-
TOMOTIVE POWER

HS-024 020

POWERED

BATTERY POWERED JEEP AND VAN PER-
FORMANCE

HS-023 866

PREDICT

OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT
TO PREDICT [LARGE MINING TRUCKS]

HS-023 998

PREDICTING

A PROGRAM FOR PREDICTING AND CONTROLLING
CARBURIZATION RESPONSE

HS-023 956

PREDICTION

PREDICTION OF SPRAY EVAPORATION IN
RECIPROCATING ENGINES

HS-023 954

PRELIMINARY

MEASURING THE LATERAL POSITION OF VEHIC-
LES ON THE ROAD: SYSTEM AND PRELIMINARY
RESULTS

HS-023 930

PRELIMINARY POWER TRAIN DESIGN FOR A
STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

PROBLEM

ROAD ACCIDENTS. A COMMUNITY PROBLEM

HS-023 983

PROBLEMS

SOME PROBLEMS AND BENEFITS FROM THE
HYDROGEN FUELED SPARK IGNITION ENGINE

HS-024 019

THE VARIABLE STROKE ENGINE: PROBLEMS AND
PROMISES

HS-023 844

PROCEEDINGS

EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY. PROCEEDINGS OF A CONFERENCE
HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1978

HS-023 824

INTER-SOCIETY ENERGY CONVERSION ENGINEER-
ING CONFERENCE (13TH) PROCEEDINGS. SAN
DIEGO, CALIFORNIA, AUGUST 20-23, 1978. VOL. 1

HS-024 005

INTER-SOCIETY ENERGY CONVERSION ENGINEER-
ING CONFERENCE (13TH) PROCEEDINGS. SAN
DIEGO, CALIFORNIA, AUGUST 20-23, 1978. VOL. 2

HS-024 018

INTER-SOCIETY ENERGY CONVERSION ENGINEER-
ING CONFERENCE (13TH) PROCEEDINGS. SAN
DIEGO, CALIFORNIA, AUGUST 20-23, 1978. VOL. 3

HS-024 024

PROCESS

NEW PROCESS MAKES GASOLINE FROM ALCOHOL

HS-024 006

PRODUCING

THE SAFETY OF TWO-WHEELED VEHICLES. A
STUDY OF AN ACCIDENT-PRODUCING SITUATION

ETUDE D'UNE SITUATION ACCIDENTOLOGIQUE 1. INTERSECTION)	ACCIDENTOLOGUE: HS-023 856	PROMISES THE VARIABLE STROKE ENGINE: PROBLEMS AND PROMISES	HS-023 844
PRODUCT PRODUCT ENERGY IN THE RUBBER INDUSTRY	HS-023 960	PROMOTING HOW THE TRUCKING INDUSTRY IS PROMOTING THE 55 M.P.H. SPEED LIMIT	HS-023 990
PRODUCTION DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION	HS-023 867	PROPULSION MECHANICALLY RECHARGEABLE, METAL-AIR BATTERIES FOR AUTOMOTIVE PROPULSION	HS-024 015
PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AU- TOMOTIVE POWER	HS-024 020	PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION	HS-024 012
PRODUCTS CALCULATIONS OF GASEOUS PRODUCTS DURING COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL.	HS-023 951	PROSPECTS PROSPECTS FOR INTERNAL COMBUSTION ENGINES AMONG ADVANCED ENERGY CONVERSION SYSTEMS	HS-024 021
PROJECT DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT	HS-023 929	PROTECTION OCCUPANT PROTECTION PROGRAM. PROGRESS RE- PORT, AUGUST 30, 1978 (PASSIVE RESTRAINT SYSTEMS)	HS-003 566
DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYELINK PROJECT	HS-023 943	THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)	HS-023 924
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 1: TECHNICAL REPORT. FINAL RE- PORT	HS-003 468	PSYCHOSOCIAL A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS	HS-023 968
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT	HS-003 469	PUBLIC PUBLIC ATTITUDES TOWARD PASSIVE RESTRAINT SYSTEMS. SUMMARY REPORT	HS-003 567
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 3: IDAHO CASE STUDY. FINAL RE- PORT	HS-003 470	THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)	HS-023 924
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 4: HENNEPIN COUNTY, MIN- NESOTA, CASE STUDY. FINAL REPORT	HS-003 471	PUBLISHED A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC-VEHICLE PERFORMANCE DATA	HS-024 011
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 5: PHOENIX, ARIZONA CASE STUDY. FINAL REPORT	HS-003 472	PUERTO EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 2: PUERTO RICO CASE STUDY. FINAL REPORT	HS-003 469
EVALUATION AND SYSTEM DESCRIPTION OF ASAP (ALCOHOL SAFETY ACTION PROJECT) JUDICIAL SYSTEMS, VOL. 6: LOS ANGELES COUNTY, CALIFORNIA CASE STUDY. FINAL REPORT	HS-003 473	PULSE PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION	HS-024 012
PROLONGED A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING	HS-023 987		

PURCHASES

HEIGHTENED FEAR OF INFLATION UNDERMINES
CONSUMER CONFIDENCE (U.S. ATTITUDES
TOWARDS AUTOMOBILES AND OTHER PURCHASES)
HS-023 990

PURIFICATION

CHARACTERIZATION OF MULTIFUNCTIONAL
CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFI-
CATION
HS-023 859

QUADRIPLEGIA

QUADRIPLEGIA AND OTHER MOTOR VEHICLE IN-
JURIES: SOME IMPLICATIONS AND CHOICES FOR
MOTOR VEHICLE MANUFACTURERS
HS-023 941

QUALITY

THE DEVELOPMENT OF QUALITY INFORMATION
SYSTEMS IN AUTOMOTIVE ASSEMBLY
HS-023 955

QUEUE

A SCHEME FOR EVALUATING A LOCAL QUEUE
WARNING SYSTEM (ANALYSIS OF TRAFFIC CON-
TROL SYSTEM)
HS-023 922

QUEUEING

THE KINETIC THEORY OF TRAFFIC FLOW IN THE
CASE OF A NONNEGOTIABLE NUMBER OF QUEUE-
ING VEHICLES
HS-023 920

RADAR

HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 961
SAFER DRIVING WITH NEW CAR RADAR
HS-023 977

RADIALS

LESSONS FROM THE FIRESTONE FRACAS
(FIRESTONE TIRE AND RUBBER COMPANY'S
STRATBOY IN THE INVESTIGATION OF ITS 500 S-
RIES STEEL-BELTED RADIALS)
HS-021 833

RADIATED

TECHNIQUE FOR CORRELATING RADIATED NOISE
WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMO-
TIVE IGNITION SYSTEM
HS-023 835

RADIATIVE

CONVECTIVE AND RADIATIVE HEAT TRANSFER IN
A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE
HS-023 948

RADIOS

'TWO-WAY RADIOS PAY OFF' FOR TENNESSEE DIS-
TRICT (SCHOOL BUSES)
HS-023 978

RANDOM

AN ANALYTICAL AND EXPERIMENTAL STUDY OF
AUTOMOBILE DYNAMICS WITH RANDOM ROAD-
WAY INPUTS
HS-023 971

RANKINE

TOWARD A HIGH EFFICIENCY RANKINE CYCLE
AUTOMOTIVE ENGINE
HS-024 023

RAP

HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 961

RARE

GENERATING HYPOTHESES TO EXPLAIN AC-
CIDENTS AND OTHER RARE EVENTS
HS-023 935

REACTION

A VALIDATION OF SUBSIDIARY REACTION TIME
AGAINST DETECTION OF ROADSIDE OBSTACLES
DURING PROLONGED DRIVING
HS-023 987

REACTIONS

AN EQUAL SENSATION STUDY OF SEATED SUB-
JECTS IN THREE TRANSLATIONAL MODES (HUMAN
REACTIONS TO VIBRATION)
HS-023 985

REALISTIC

RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT
HS-023 823

REAR

INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL
AUTOMOTIVE CRASHES
HS-023 927
THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON
AUTOMOBILES WITH FRONT AND REAR SPOILERS
HS-023 868

RECALL

SAFETY RELATED RECALL CAMPAIGNS FOR
MOTOR VEHICLES AND MOTOR VEHICLE EQUIP-
MENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH
MARCH 31, 1978. DETAILED REPORTS
HS-803 529

RECENT

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO
AID NSU, AND OTHER ROTARY DEVELOPMENTS
(MOST RECENT ROTARY ENGINE DESIGNS)
HS-023 994

URBAN FUEL ECONOMY: AN ALTERNATE IN-
TERPRETATION OF RECENT COMPUTER SIMULA-
TION CALCULATIONS
HS-023 828

RECHARGEABLE

MECHANICALLY RECHARGEABLE, METAL-AIR
BATTERIES FOR AUTOMOTIVE PROPULSION
HS-024 015

RECIPROCATING

PREDICTION OF SPRAY EVAPORATION IN
RECIPROCATING ENGINES
HS-023 954

RECIRCULATION

FAST BURN-HEAVY EGR IMPROVES ECONOMY,
REDUCES NOX (SHORT COMBUSTION DURATION)

ADD-ONS REDUCE AIR DRAG (PASSENGER CARS)	HS-023 979	RESISTANT CORROSION RESISTANT STEEL, AND NONFERROUS MATERIALS FOR METRIC FASTENERS	HS-023 967
REDUCES FAST BURN-HEAVY BGR IMPROVES ECONOMY, REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)	HS-023 846	RESPONSE A PROGRAM FOR PREDICTING AND CONTROLLING CARBURIZATION RESPONSE	HS-023 956
REDUCTIONS THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS	HS-023 868	RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT	HS-023 823
REGULATION STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978	HS-810 324	RESPONSE OF LEAD-ACID BATTERIES TO CHOPPER- CONTROLLED DISCHARGE	HS-024 017
REGULATIONS BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)	HS-024 029	RESTRAINED FATAL INJURIES TO RESTRAINED PASSENGER CAR OCCUPANTS	HS-023 926
REPAIR EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CON- GRESS	HS-803 536	RESTRAINT AIR CUSHION RESTRAINT SYSTEMS, A BIBLIOG- RAPHY	HS-023 914
REQUIREMENTS DRIVER'S VISIBILITY REQUIREMENTS FOR ROAD- WAY DELINEATION, VOL. 1: EFFECTS OF CON- TRAST AND CONFIGURATION ON DRIVER PER- FORMANCE AND BEHAVIOR. FINAL REPORT	HS-023 852	OCCUPANT PROTECTION PROGRAM. PROGRESS RE- PORT, AUGUST 30, 1978 (PASSIVE RESTRAINT SYSTEMS)	HS-803 566
RESEARCH AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER	HS-023 832	PUBLIC ATTITUDES TOWARD PASSIVE RESTRAINT SYSTEMS. SUMMARY REPORT	HS-803 567
EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976	HS-023 824	RESULTS MEASURING THE LATERAL POSITION OF VEHIC- LES ON THE ROAD: SYSTEM AND PRELIMINARY RESULTS	HS-023 930
INJURY SCALING RESEARCH. FINAL REPORT	HS-803 452	REVIEW A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC VEHICLE PERFORMANCE DATA	HS-024 011
RESEARCH SAFETY VEHICLE, PHASE 3. STATUS REPORT NO. 9, 1 MAY TO 30 JUNE 1978	HS-803 533	GAS TURBINES -- A BRIEF REVIEW OF BASIC TYPES	HS-023 963
RSV (RESEARCH SAFETY VEHICLE) PHASE III. BIMONTHLY PROGRESS REPORT, APRIL/MAY 1978	HS-803 568	LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHIC- LES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)	HS-023 906
		REVISED HOW TO DRIVE. REVISED ED.	HS-023 913
		REVOLUTION REVOLUTION IN CAR WIRING	HS-023 923
		REVOLUTION IN CERAMIC DESIGN (DIESEL, AND GAS-TURBINE ENGINES AND OTHER APPLICA- TIONS)	HS-023 919

RH
THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE
HS-023 860

RHODIUM
THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE
HS-023 860

RICO
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY.
FINAL REPORT
HS-003 469

ROAD
DEFORMATION AND CORD TENSION OF A BIAS
TIRE IN CONTACT WITH THE ROAD
HS-023 837
MEASURING THE LATERAL POSITION OF VEHIC-
LES ON THE ROAD: SYSTEM AND PRELIMINARY
RESULTS
HS-023 930

ROAD ACCIDENTS. A COMMUNITY PROBLEM
HS-023 983
USER EXPERIENCE WITH ON-ROAD ELECTRIC
VEHICLES IN THE U.S.A. AND CANADA
HS-024 010

ROADSIDE
A VALIDATION OF SUBSIDIARY REACTION TIME
AGAINST DETECTION OF ROADSIDE OBSTACLES
DURING PROLONGED DRIVING
HS-023 987

ROADWAY
AN ANALYTICAL AND EXPERIMENTAL STUDY OF
AUTOMOBILE DYNAMICS WITH RANDOM ROAD-
WAY INPUTS
HS-023 971

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3 APPEN-
DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT**
HS-023 904

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE
SUMMARY. FINAL REPORT**
HS-023 839

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX
B. DEVELOPMENT AND DESCRIPTION OF COMPU-
TERIZED DATA BASE. FINAL REPORT**
HS-023 841

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX
C. STATISTICAL MODEL DEVELOPMENT**
HS-023 842

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 6. APPEN-
DICES D AND E. COST OF ROADWAY ACCIDENTS
AND COST AND SERVICE LIFE OF ROADWAY
DELINEATION TREATMENTS. FINAL REPORT**
HS-023 905

**DRIVER'S VISIBILITY REQUIREMENTS FOR ROAD-
WAY DELINEATION. VOL. 1: EFFECTS OF CON-
TRAST AND CONFIGURATION ON DRIVER PER-
FORMANCE AND BEHAVIOR. FINAL REPORT**
HS-023 852

ROLLING
A NOTE ON TIRE ROLLING RESISTANCE DUE TO
TEST WHEEL CURVATURE
HS-023 936

ROTARY
A WORLDWIDE ROTARY UPDATE. TOYO KOGYO,
AUDI NSU, AND OTHER ROTARY DEVELOPMENTS
[MOST RECENT ROTARY ENGINE DESIGNS]
HS-023 994

**PERFORMANCE CHARACTERISTICS OF AUTO-
MOTIVE ENGINES IN THE UNITED STATES. FIRST
SERIES. REPORT NO. 14: 1973 MAZDA ROTARY 70 CID
(1.1 LITERS), 4V. INTERIM REPORT**
HS-003 324

THE ROTARY IS NOT DEAD [WANKEL ENGINE]
HS-024 026

ROUES
LE DEUX ROUES. REVUE DE LA LITTÉRATURE
FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHIC-
LES. A REVIEW OF FRENCH AND FOREIGN
LITERATURE)
HS-023 906

**THE SAFETY OF TWO-WHEELED VEHICLES. A
STUDY OF AN ACCIDENT-PRODUCING SITUATION:
THE INTERSECTION (SECURITÉ DES DEUX ROUES.
ÉTUDE D'UNE SITUATION ACCIDENTOGÈNE:
L'INTERSECTION)**
HS-023 856

ROUTE
CONTROL OF DRIVERS' ROUTE CHOICE: PIPE
DREAM OR PANACEA?
HS-023 851

**HIGHWAY ACCIDENT REPORT. USHER TRANSPORT,
INC., TRACTOR-CARCO-TANK-SMTRAILER OVER-**

RSV (RESEARCH SAFETY VEHICLE) PHASE III
BIMONTHLY PROGRESS REPORT, APRIL/MAY 1978
HS-803 568

RUBBER

EFFECT OF TREATED CELLULOSE FIBERS ON CUT
GROWTH, CUTTING AND CHIPPING CHARACTERISTICS
OF RUBBER COMPOUNDS (TIRE TREADS)
HS-023 959

LESSONS FROM THE FIRESTONE FRACAS
(FIRESTONE TIRE AND RUBBER COMPANY'S
STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES
STEEL-BELTED RADIALS)
HS-023 833

PRODUCT ENERGY IN THE RUBBER INDUSTRY
HS-023 960

RURAL

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 1. APPENDIX A, SITE SELECTION AND DATA
COLLECTION. FINAL REPORT
HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT
HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 2: FINAL REPORT
HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND
DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT
HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL
DEVELOPMENT
HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE
HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF
ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF
ROADWAY DELINEATION TREATMENTS. FINAL REPORT
HS-023 905

RUSH

A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE
DESIGN
HS-023 944

SAFELY

BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC
COMMUNITY) BRAKING REGULATIONS, ANTI-SKID
SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)
HS-024 029

SAFER

SAFER DRIVING WITH NEW CAR RADAR
HS-023 977

SAMPLING

INVESTIGATING DIESEL ENGINE COMBUSTION BY
MEANS OF A TIMED SAMPLING VALVE
HS-023 950

SAVINGS

LIGHTER, CHEAPER COMPOUNDS WITH GLASS
BUBBLES IN PLASTICS (WRIGHT SAVINGS IN
AUTOMOBILE PARTS)
HS-024 003

STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978
HS-810 324

TRUCKER'S GUIDE TO FUEL SAVINGS
HS-023 915

SCALING

INJURY SCALING RESEARCH. FINAL REPORT
HS-803 452

SCHEME

A SCHEME FOR EVALUATING A LOCAL QUEUED
WARNING SYSTEM (ANALYSIS OF TRAFFIC CONTROL
SYSTEM)
HS-021 922

SCHOOL

TWO-WAY RADIOS PAY OFF FOR TENNESSEE
DISTRICT (SCHOOL BUSES)
HS-023 978

SCIENCE

STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978
HS-810 324

SEALED

MORE LIGHT, LESS ELECTRICITY WITH HALOGEN
SEALED-BEAMS (HEADLIGHTS)
HS-024 027

SEAT
INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL
AUTOMOTIVE CRASHES
HS-023 927

SEATED
AN EQUAL SENSATION STUDY OF SEATED SUB-
JECTS IN THREE TRANSLATIONAL MODES (HUMAN
REACTIONS TO VIBRATION)
HS-023 985

SEATS
IS YOUR CAR KILLING YOU? OR RATHER, ARE ITS
SEATS?
HS-024 028

SECURITE
THE SAFETY OF TWO-WHEELED VEHICLES. A
STUDY OF AN ACCIDENT-PRODUCING SITUATION:
THE INTERSECTION (SECURITE DES DEUX ROUES.
ETUDE D'UNE SITUATION ACCIDENTOGENE:
L'INTERSECTION)
HS-023 856

SELECTION
COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPEN-
DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT
HS-023 904

SELF
OVERCOMING DENIAL: CHANGING THE SELF-CON-
CEPTS OF DRUNKEN DRIVERS
HS-023 970

SEMITRAILER
HIGHWAY ACCIDENT REPORT. USHER TRANSPORT,
INC., TRACTOR-CAROO-TANK-SEMITRAILER OVER-
TURN AND FIRE, STATE ROUTE 11, BEATTYVILLE,
KENTUCKY, SEPTEMBER 24, 1977
HS-023 966

SENATE
STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978
HS-010 324

SENBUKU
CLEAN TRANSPORTATION FOR NEW TOWNS.
DAIHATSU ELECTRIC VEHICLES IN THE SENBUKU
AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)
HS-023 864

SENSATION
AN EQUAL SENSATION STUDY OF SEATED SUB-
JECTS IN THREE TRANSLATIONAL MODES (HUMAN
REACTIONS TO VIBRATION)
HS-023 985

SENSOR
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
(IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL)
HS-023 834

**NEW SENSORS FOR AUTOMOBILE ENGINE CON-
TROL**
HS-023 976

SEQUENCES
A DRIVING CYCLE FOR SYDNEY (DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA)
HS-023 826

SERIES
LESSONS FROM THE FIRESTONE FRACAS
(PIRESTONE TIRE AND RUBBER COMPANY'S
STRATEGY IN THE INVESTIGATION OF ITS 500 SE-
RIES STEEL-BELTED RADIALS)
HS-023 833

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID
(1.1 LITERS), 4V. INTERIM REPORT
HS-803 324

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6
LITERS), 2V. INTERIM REPORT
HS-803 325

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0
LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 326

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5
LITERS), 4V. INTERIM REPORT
HS-803 327

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 18: 1976 FORD 400 CID (6.6
LITERS), 2V. INTERIM REPORT
HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID
(5.7 LITERS), 2V. INTERIM REPORT
HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7
LITERS) WITH DRESSER VARIABLE-AREA VENTURI
SYSTEM. INTERIM REPORT
HS-803 330

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4
LITERS), 1V. INTERIM REPORT
HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3
LITERS), 2V. INTERIM REPORT
HS-803 332

- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT**
HS-803 333
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT**
HS-803 334
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT**
HS-803 335
- SERVICE**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6. APPENDICES D AND E. COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT
HS-023 905
- SERVICES**
EMERGENCY MEDICAL SERVICES: RESEARCH METHODOLOGY. PROCEEDINGS OF A CONFERENCE HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10, 1976
HS-023 824
- SHELTER**
TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS
HS-023 972
- SHOPPING**
SHOPPING FOR TYRES? (TIRES)
HS-023 937
- SHORT**
FAST BURN-HEAVY BGR IMPROVES ECONOMY. REDUCES NOX (SHORT COMBUSTION DURATION, EXHAUST GAS RECIRCULATION REDUCES NITROGEN OXIDES)
HS-023 846
- SHORTAGES**
AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT
HS-803 454
- SHREDS**
TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS
HS-023 972
- SIGNIFICANCE**
THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)
HS-023 924
- SILICON**
LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-023 991
- SIMULATION**
URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS
HS-023 828
- SIMULATIONS**
SIMULATIONS OF TRAFFIC CONGESTION IN TORONTO
HS-023 827
- SIMULATOR**
IS THERE A PLACE FOR THE SIMULATOR IN DRIVER LICENSING? (NEW YORK STUDY)
HS-023 989
- SITE**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1. APPENDIX A. SITE SELECTION AND DATA COLLECTION. FINAL REPORT
HS-023 904
- SITUATION**
THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)
HS-023 856
- SKID**
BRAKING SAFETY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)
HS-024 029
- CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS
HS-023 916
- SKIDS**
WHITEHURST TALKS ABOUT STUFS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)
HS-023 981
- SKILLS**
POLICE LEARN DRIVING SKILLS AT LOW SPEEDS
HS-023 995
- SMALL**
EVALUATION OF DIAGNOSTIC ANALYSIS AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS
HS-803 536
- SMALL-CAR AIRBAG PERFORMANCE STUDIED
HS-023 845
- SNAPS**
BONDED BUS SNAPS TOGETHER
HS-024 002
- SOARING**
WHY MOTORCYCLE DEATHS ARE SOARING
HS-023 991

SODIUM
PULSE CHARACTERISTICS OF SODIUM SULFUR
CELLS FOR ELECTRIC VEHICLE PROPULSION
HS-024 012

SOLUTIONS
PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-
THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE
SOLUTIONS
HS-023 850

SOURCES
DATA SOURCES TO SUPPORT THE NHTSA
[NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] DEFECTS INVESTIGATION SYSTEM
FINAL REPORT
HS-003 531

SPARK
SOME PROBLEMS AND BENEFITS FROM THE
HYDROGEN FUELED SPARK IGNITION ENGINE
HS-024 019
TECHNIQUE FOR CORRELATING RADIATED NOISE
WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE
IGNITION SYSTEM
HS-023 835

SPECIAL
SPECIAL STEEL EXTENDS BRAKING LIFE
HS-024 000

SPEED
AN EXAMINATION OF THE EFFECTS OF THE
LOWERED MAXIMUM SPEED LIMIT AND FUEL
SHORTAGES IN NORTH CAROLINA. FINAL REPORT
HS-003 454
GUIDE TO HIGH SPEED PATROL CAR TIRES
HS-023 909

HOW THE TRUCKING INDUSTRY IS PROMOTING
THE 55 M.P.H. SPEED LIMIT
HS-023 990

TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT
[INDIANA HIGHWAYS]
HS-023 974

SPEEDERS
HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 961

SPEEDS
POLICE LEARN DRIVING SKILLS AT LOW SPEEDS
HS-023 995

SPOILERS
THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON
AUTOMOBILES WITH FRONT AND REAR SPOILERS
HS-023 868

SPRAY
PREDICTION OF SPRAY EVAPORATION IN
RECIPROCATING ENGINES
HS-023 954

STABILITY
GRADE EFFECTS ON TRAFFIC FLOW STABILITY
AND CAPACITY
HS-023 838

THE DYNAMIC STABILITY OF FUEL-CARRYING
DOUBLE-TANKER TRUCKS IN MICHIGAN
HS-023 825

STAGE
A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF
VEHICLE DESIGN
HS-023 944

STANDARDS
WHENCE THE 1981-84 FUEL ECONOMY STANDARDS?
HS-023 848

STATEMENT
STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978
HS-810 324

STATES
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID
(1.1 LITERS), 4V. INTERIM REPORT
HS-003 324

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 15: 1975 DODGE COIT 90 CID (1.6
LITERS), 2V. INTERIM REPORT
HS-003 325

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0
LITERS), F.I. [FUEL INJECTION] INTERIM REPORT
HS-003 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5
LITERS), 4V. INTERIM REPORT
HS-003 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6
LITERS), 2V. INTERIM REPORT
HS-003 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID
(5.7 LITERS), 2V. INTERIM REPORT
HS-003 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. FIRST
SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7
LITERS) WITH DRESSER VARIABLE-AREA VENTURI
SYSTEM. INTERIM REPORT
HS-003 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE
ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4
LITERS), 4V. INTERIM REPORT
HS-003 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V, INTERIM REPORT

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V, INTERIM REPORT

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES, THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-803 335

STATISTICAL

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS, VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

HS-023 842

STATISTICAL ANALYSES OF COMMERCIAL VEHICLE ACCIDENT FACTORS, VOL. 1, TECHNICAL REPORT, PT. 1, FINAL REPORT

HS-803 418

1978 MOTORCYCLE STATISTICAL ANNUAL

HS-023 975

STEEL

CORROSION RESISTANT STEEL AND NONFERROUS MATERIALS FOR METRIC FASTENERS

HS-023 967

LESSONS FROM THE FIRESTONE FRACAS [PIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS]

HS-023 833

SPECIAL STEEL EXTENSIVE BEARING LIFE

HS-024 000

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

HS-023 857

STEELS

LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS

HS-023 957

TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)

HS-023 857

STOCHASTIC

STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE

HS-021 949

STOPPING

WHITHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING [CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS]

HS-021 981

STORAGE

CHOOSING AND CARING FOR STORAGE BATTERIES

HS-023 992

STRAIGHTAWAYS

HEADLIGHT IMPROVEMENTS, BRIGHTEN THE CORNERS (AND THE STRAIGHTAWAYS) WHERE YOU ARE

HS-023 918

STRATEGIES

STRATIFIED CHARGE MIXING STRATEGIES COMPARED

HS-023 845

STRATEGY

LESSONS FROM THE FIRESTONE FRACAS [PIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SERIES STEEL-BELTED RADIALS]

HS-023 833

STRATIFIED

STRATIFIED CHARGE MIXING STRATEGIES COMPARED

HS-023 845

STRESS

STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD

HS-023 932

STROKE

THE VARIABLE STROKE ENGINE: PROBLEMS AND PROMISES

HS-023 844

STUDIED

SMALL-CAR AIRBAG PERFORMANCE STUDIED

HS-023 849

STUDS

WHITHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING [CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS]

HS-023 981

SUBCOMMITTEE

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCIAL SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

SUBJECTS

AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES [HUMAN REACTIONS TO VIBRATION]

HS-023 985

AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING	HS-023 987	GINES USING A WATER MODEL	HS-023 953
SUBURBAN CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU ARBA (MODEL SUBURBAN COMMUNITY IN JAPAN)	HS 023 864	SYDNEY A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)	HS-023 826
SULFATE THE ROLE OF RHODIUM IN RH/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HIC/NOX AND SO4 [CARBON MONOX- IDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE	HS-023 860	SYNCHRONOUS SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY	HS-023 973
SULFIDE ADVANCES IN THE DEVELOPMENT OF LITHIUM- ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC VEHICLE BATTERIES	HS-024 014	TAKEOVER DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)	HS-023 996
LITHIUM SILICON - IRON SULFIDE LOAD-LEVEL- ING AND ELECTRIC VEHICLE BATTERIES	HS-024 013	TALKS WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING [CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS]	HS-023 981
SULFUR PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION	HS-024 012	TANK AN ON-BOARD SENSOR FOR PERCENT ALCOHOL [IN-TANK ETHANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL]	HS-023 834
SUPPLY MOTOR GASOLINE SUPPLY AND DEMAND 1967-1978	HS-023 984	HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SEMITRAILER OVER- TURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977	HS-023 966
SUPPORT DATA SOURCES TO SUPPORT THE NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS- TRATION] DEFICITS INVESTIGATION SYSTEM. FINAL REPORT	HS-803 531	TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS	HS-023 972
EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS	HS-023 861	TANKER THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN	HS-023 825
SURVEY THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT	HS-023 911	TASK TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)	HS-023 857
SURVEYS TRAFFIC CONFLICT SURVEYS. SOME STUDY DESIGN CONSIDERATIONS	HS-023 910	TECHNOLOGY THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION	HS-024 009
SWIRL A NEW METHOD OF INVESTIGATION OF SWIRL PORTS	HS-023 945	TEEN DRINKING AGE IMPLICATIONS BECOMING CLEARER. TEEN DRINKING PATTERNS AFFECTED BY LAW CHANGE	HS-023 982
CONVECTIVE AND RADIATIVE HEAT TRANSFER IN A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE	HS-023 946	TEMPERATURE AMBIENT TEMPERATURE AND TRIP LENGTH-IN- FLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS	HS-023 908

TEMPERATURES DIESEL PISTON TEMPERATURES MEASURED	HS-023 999
TENNESSEE TWO-WAY RADIOS PAY OFF FOR TENNESSEE DISTRICT (SCHOOL BUSES)	HS-023 978
TENSION DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD	HS-023 837
TERTIARY MTBE BEING EVALUATED AS ALTERNATE FUEL COMPONENT (METHYL TERTIARY BUTYL ETHER)	HS-023 917
TEST A NOTE ON TIRE ROLLING RESISTANCE DUE TO TEST WHEEL CURVATURE	HS-023 936
DRIVER AID AND EDUCATION TEST PROJECT. FINAL REPORT	HS-023 929
EVALUATION OF DIAGNOSTIC ANALYSES AND TEST EQUIPMENT FOR SMALL AUTOMOTIVE REPAIR ESTABLISHMENTS. A REPORT TO THE CONGRESS	HS-803 536
WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)	HS-023 961
TESTING A DRIVING CYCLE FOR SYDNEY (DURATION OF DRIVING SEQUENCES DURING EMISSION TESTING OF AUTOMOBILES, AUSTRALIA)	HS-023 826
TESTS DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT	HS-803 460
WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)	HS-023 961
THEORY THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES	HS-023 920
THINGS THE STATUS OF MANDATORY PMVI (PERIODIC MOTOR VEHICLE INSPECTION): THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT	HS-023 980
THIRD PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES. REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT	HS-803 335
THREADED ANALYSIS AND DESIGN OF THREADED ASSEMBLIES (MECHANICAL FASTENERS)	HS-024 007
TIME A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING	HS-023 967
TIMED INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE	HS-023 950
TIMING SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY	HS-023 973
TIRE A NOTE ON TIRE ROLLING RESISTANCE DUE TO TEST WHEEL CURVATURE	HS-023 936
DEFORMATION AND CORD TENSION OF A BIAS TIRE IN CONTACT WITH THE ROAD	HS-023 837
EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)	HS-023 959
LESSONS FROM THE FIRESTONE FRACAS (FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 550 SERIES STEEL-BELTED RADIALS)	HS-023 833
STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD	HS-023 932
TIRE VIBRATIONS	HS-023 836
TIRES GUIDE TO HIGH SPEED PATROL CAR TIRES	HS-023 909
SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS	HS-803 529
SHOPPING FOR TYRES? (TIRES)	HS-023 937
TOGETHER BONDED BUS SNAPS TOGETHER	HS-024 002
TORONTO SIMULATIONS OF TRAFFIC CONGESTION IN TORONTO	HS-023 827
TOWNS CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)	HS-023 864

- ROADWAY DESIGN (HIGHWAY DESIGN)
[MOST RECENT ROTARY ENGINE DESIGNS] HS-023 994
- TRACTOR**
HIGHWAY ACCIDENT REPORT, USHER TRANSPORT, INC., TRACTOR-CAROO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977 HS-023 966
- TRAFFIC**
A SCHEME FOR EVALUATING A LOCAL QUEUE WARNING SYSTEM (ANALYSIS OF TRAFFIC CONTROL SYSTEM) HS-023 922
AN ATTEMPT TO CHARACTERIZE TRAFFIC IN METROPOLITAN AREAS HS-023 921
ASSESSMENT OF THE EFFECT ON TRAFFIC ACCIDENTS OF THE LOWERING OF THE LEGAL DRINKING AGE IN ILLINOIS HS-023 907
DATA SOURCES TO SUPPORT THE NHTSA (NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION) DEFECTS INVESTIGATION SYSTEM. FINAL REPORT HS-003 531
GRADE EFFECTS ON TRAFFIC FLOW STABILITY AND CAPACITY HS-023 838
PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-THE-ART ANALYSIS AND EVALUATION OF EFFECTIVE SOLUTIONS HS-023 850
SIMULATIONS OF TRAFFIC CONGESTION IN TORONTO HS-023 827
STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978 HS-810 324
THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUEING VEHICLES HS-023 928
TRAFFIC CONFLICT SURVEYS: SOME STUDY DESIGN CONSIDERATIONS HS-023 910
TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT (INDIANA HIGHWAYS) HS-023 974
- TRAIN**
PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE HS-023 965
- TRANSIENT**
TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND HS-023 876
- TRANSLATIONAL**
AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES (HUMAN REACTIONS TO VIBRATION) HS-023 985
- TRANSMISSION**
AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY HS-023 958
- TRUCK**
HIGHWAY ACCIDENT REPORT, USHER TRANSPORT, INC., TRACTOR-CAROO-TANK-SEMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977 HS-023 966
- TRANSPORTATION**
CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA (MODEL SUBURBAN COMMUNITY IN JAPAN) HS-023 864
STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978 HS-810 324
THE NATIONAL SURVEY OF TRANSPORTATION HANDICAPPED PEOPLE. SUMMARY REPORT HS-023 911
THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION HS-024 009
- TREADS**
EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS) HS-023 959
- TREATED**
EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARACTERISTICS OF RUBBER COMPOUNDS (TIRE TREADS) HS-023 959
- TREATMENTS**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A. SITE SELECTION AND DATA COLLECTION. FINAL REPORT HS-023 904

- SUMMARY, FINAL REPORT** HS-023 839
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT** HS-023 840
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT** HS-023 841
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT** HS-023 842
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT** HS-023 905
- TRENDS**
- BRAKING SAFELY? (NEW EEC (EUROPEAN ECONOMIC COMMUNITY) BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS)** HS-024 029
- TRIP**
- AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS** HS-023 908
- TRUCK**
- OFF-HIGHWAY HYDRAULIC NOISE CAN BE CUT [HARVESTING MACHINE, FORKLIFT TRUCK]** HS-023 997
- TRUCKER**
- TRUCKER'S GUIDE TO FUEL SAVINGS** HS-023 915
- TRUCKERS**
- TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS** HS-023 972
- TRUCKING**
- HOW THE TRUCKING INDUSTRY IS PROMOTING THE 55 M.P.H. SPEED LIMIT** HS-023 990
- TRUCKS**
- DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)** HS-023 996
- OFF-HIGHWAY BRAKE PERFORMANCE DIFFICULT TO PREDICT [LARGE MINING TRUCKS]** HS-023 998
- TUNNELS**
- AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER** HS-023 832
- TURBINE**
- COMBINED CYCLE GAS TURBINE FOR AN AUTOMOBILE APPLICATION** HS-024 022
- REVOLUTION IN CERAMIC DESIGN [DIESEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS]** HS-023 919
- TURBINES**
- GAS TURBINES -- A BRIEF REVIEW OF BASIC TYPES** HS-023 963
- TWICE**
- MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED** HS-023 969
- TYPE**
- DYNAMIC EYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION EYECLIPPER PROJECT** HS-023 943
- TYPES**
- GAS TURBINES -- A BRIEF REVIEW OF BASIC TYPES** HS-023 963
- TYRES**
- SHOPPING FOR TYRES? (TIRES)** HS-023 937
- UNDERMINES**
- HEIGHTENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE [U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES]** HS-023 993
- UNDERVEHICLE**
- TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAE-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)** HS-023 857
- UNITED**
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT** HS-803 324
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT** HS-803 325
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT** HS-803 326

March 31, 1979

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT

HS-803 327

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT

HS-803 328

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT

HS-803 329

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), 4V. INTERIM REPORT

HS-803 331

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT

HS-803 332

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-803 333

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT

HS-803 334

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), P.I. (FUEL INJECTION) INTERIM REPORT

HS-803 335

60 MPG BY 1985 (MILES PER GALLON, UNITED KINGDOM)

HS-023 933

UNOPPOSED

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING

HS-023 942

UNREGULATED

UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS

HS-023 862

UPDATE

A WORLDWIDE ROTARY UPDATE, TOYO KOGYO, AUDI NSU, AND OTHER ROTARY DEVELOPMENTS [MOST RECENT ROTARY ENGINE DESIGNS]

HS-023 994

URBAN

URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS

HS-023 828

USER

USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA

HS-024 010

USHER

HIGHWAY ACCIDENT REPORT. USHER TRANSPORT, INC., TRACTOR-CARGO-TANK-SMITRAILER OVERTURN AND FIRE, STATE ROUTE 11, BEATTYVILLE, KENTUCKY, SEPTEMBER 24, 1977

HS-023 966

UTILIZATION

PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER

HS-024 020

THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION

HS-024 009

VALIDATION

A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING

HS-023 987

VALVE

INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE

HS-023 950

VAN

BATTERY POWERED JEEP AND VAN PERFORMANCE

HS-023 866

THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD

HS-023 869

VARIABLE

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

THE VARIABLE STROKE ENGINE: PROBLEMS AND PROMISES

HS-023 844

VEHICLE

A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC VEHICLE PERFORMANCE DATA

A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN

HS-023 944

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

HS-024 014

AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY

HS-023 558

DYNAMIC RYE POSITIONS BY VEHICLE TYPE. FINAL REPORT OF THE SECOND GENERATION BY ELLIPSE PROJECT

HS-023 943

LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES

HS-024 013

PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION

HS-024 012

QUADRIFLEXIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS

HS-023 941

RESEARCH SAFETY VEHICLE, PHASE 3. STATUS REPORT NO. 9, 1 MAY TO 30 JUNE 1978

HS-803 533

RSV [RESEARCH SAFETY VEHICLE] PHASE III BIMONTHLY PROGRESS REPORT, APRIL/MAY 1978

HS-803 568

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS

HS-803 529

STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER THE MOTOR VEHICLE INFORMATION AND COST SAVINGS ACT AND THE NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, JULY 26, 1978

HS-810 324

STATISTICAL ANALYSIS OF COMMERCIAL VEHICLE ACCIDENT FACTORS. VOL. 1, TECHNICAL REPORT, PT. 1, FINAL REPORT

HS-803 418

THE STATUS OF MANDATORY PMVI [PERIODIC MOTOR VEHICLE INSPECTION]: THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT

HS-023 980

VEHICLES

A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC VEHICLES

HS-023 863

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 982

CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]

HS-023 864

DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION

HS-023 867

IRON-AIR BATTERIES FOR ELECTRIC VEHICLES

HS-024 026

LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)

HS-023 906

MEASURING THE LATERAL POSITION OF VEHICLES ON THE ROAD: SYSTEM AND PRELIMINARY RESULTS

HS-023 910

SAFETY RELATED RECALL CAMPAIGNS FOR MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH MARCH 31, 1978. DETAILED REPORTS

HS-803 529

THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUING VEHICLES

HS-023 930

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

HS-023 856

TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND

HS-023 870

USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA

HS-024 010

VENTURI

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES. REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT

HS-803 330

VERTICAL

STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A FINITE ELEMENT METHOD

HS-023 932

VIBRATION

AN EQUAL SENSATION STUDY OF SPATED SUBJECTS IN THREE TRANSLATIONAL MODES [HUMAN REACTIONS TO VIBRATION]

HS-023 985

VIBRATIONS

TIRE VIBRATIONS

HS-023 836

VIRGINIA
AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORKING PLAN

HS-024 030

VISIBILITY

A VISIBILITY ANALYSIS OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING

HS-023 942

DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. I: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT

HS-023 852

VISUAL

ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING

HS-023 831

VOLVO

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES. REPORT NO. 16: 1975 VOLVO 121 C10 (2.0 LITERS). P.I. (FUEL INJECTION) INTERIM REPORT

HS-003 326

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES. REPORT NO. 1: 1977 VOLVO 130 C10 (2.1 LITERS). P.I. (FUEL INJECTION) INTERIM REPORT

HS-003 335

WANKEL

THE ROTARY IS NOT DEAD (WANKEL ENGINE)

HS-024 026

WARNING

A SCHEME FOR EVALUATING A LOCAL QUEUE WARNING SYSTEM (ANALYSIS OF TRAFFIC CONTROL SYSTEM)

HS-023 922

WASTE

USING WASTE HEAT BOOSTS DIESEL EFFICIENCY

HS-023 843

WATER

INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL

HS-023 953

WAY

ECC-I plus 3-WAY/ECC-II (FORD'S ELECTRONIC ENGINE CONTROL)

HS-023 847

EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS

HS-023 861

MAZDA'S NEW 3-WAY SYSTEM NEEDS NO AIR/FUEL FEEDBACK

HS-024 001

THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM

HS-023 858

• TWO-MAY RADIOS PAY OFF FOR TENNESSEE DISTRICT (SCHOOL BUSES)

HS-023 978

UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS

HS-023 862

WEIGHT

DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS

HS-023 964

LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AUTOMOBILE PARTS)

HS-024 003

WHEEL

A NOTE ON TIRE ROLLING RESISTANCE DUE TO TEST WHEEL CURVATURE

HS-023 936

WHEELED

LE DEUX ROUES. REVUE DE LA LITTÉRATURE FRANÇAISE ET ÉTRANGÈRE (TWO-WHEELED VEHICLES. A REVIEW OF FRENCH AND FOREIGN LITERATURE)

HS-023 906

THE SAFETY OF TWO-WHEELED VEHICLES. A STUDY OF AN ACCIDENT-PRODUCING SITUATION: THE INTERSECTION (SECURITE DES DEUX ROUES. ETUDE D'UNE SITUATION ACCIDENTOGENE: L'INTERSECTION)

HS-023 856

WHENCE

WHENCE THE 1981-84 FUEL ECONOMY STANDARDS?

HS-023 848

WHITEHURST

WHITEHURST TALKS ABOUT STUDS, SKIDS, AND STOPPING (CHIEF TEST OFFICIAL AT NATIONAL SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

WIND

A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN

HS-023 944

AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER

HS-023 832

TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND

HS-023 870

WINDSHIELD

SYNCHRONOUS TIMING LOOP CONTROLS WINDSHIELD WIPER DELAY

HS-023 973

WINDSOR

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES. REPORT NO. 19: 1975 FORD WINDSOR 351 CID (5.7 LITERS). 2V. INTERIM REPORT

HS-003 329

WINTER

MOTOR GASOLINES, WINTER 1977-78

HS-023 940

WHITEHURST TALKS ABOUT STUDB, SKIDS, AND
STOPPING (CHIEF TEST OFFICIAL AT NATIONAL
SAFETY COUNCIL'S WINTER DRIVING TESTS)

HS-023 981

WIPER

SYNCHRONOUS TIMING LOOP CONTROLS
WINDSHIELD WIPER DELAY

HS-023 973

WIRING

REVOLUTION IN CAR WIRING

HS-023 923

WORKING

AN EVALUATION OF THE IMPACT OF THE VIR-
GINIA DRIVER IMPROVEMENT PROGRAM. WORK-
ING PLAN

HS-024 030

WORLDWIDE

A WORLDWIDE ROTARY UPDATE. TOYO KOGYO,
AUDI NSU, AND OTHER ROTARY DEVELOPMENTS
[MOST RECENT ROTARY ENGINE DESIGNS]

HS-023 994

YORK

IS THERE A PLACE FOR THE SIMULATOR IN
DRIVER LICENSING? (NEW YORK STUDY)

HS-023 989

ZINC

A HIGH ENERGY NICKEL-ZINC BATTERY FOR
ELECTRIC VEHICLES

HS-023 863

ZONE

CALCULATIONS OF GASEOUS PRODUCTS DURING
COMBUSTION IN A DIESEL ENGINE USING A FOUR
ZONE MODEL

HS-023 951

vanAllen, Neil K.
AIR CUSHION RESTRAINT SYSTEMS, A BIBLIOGRAPHY
HS-023 914

RURAL TWO-LANE HIGHWAYS. VOL. I: EXECUTIVE SUMMARY. FINAL REPORT

Ahmed, S. R.
THE CALCULATION OF THE FLOW FIELD PAST A
VAN WITH THE AID OF A PANEL METHOD
HS-023 869

HS-023 819
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

Akasaka, Takashi
DEFORMATION AND CORD TENSION OF A BIAS
TIRE IN CONTACT WITH THE ROAD
HS-023 837

HS-023 840
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B. DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

Alexander, E. M.
ANALYSIS AND DESIGN OF THREADED ASSEMBLIES (MECHANICAL FASTENERS)
HS-024 007

HS-023 841
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C. STATISTICAL MODEL DEVELOPMENT

Allen, G. R.
A DRIVING CYCLE FOR SYDNEY [DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA]
HS-073 626

HS-023 842
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6. APPENDICES D AND E. COST OF ROADWAY ACCIDENTS

Allen, R. W.
DRIVER'S VISIBILITY REQUIREMENTS FOR ROAD-
WAY DELINEATION. VOL. 1: EFFECTS OF CON-
TRAST AND CONFIGURATION ON DRIVER PER-
FORMANCE AND BEHAVIOR. FINAL REPORT

HS-021 905

Allison, A.
 EFFECTIVE FLOW AREA OF PISTON CONTROLLED
 EXHAUST AND INLET PORTS
 HS-023 9-52

Saluswamy, N.
CALCULATIONS OF GASEOUS PRODUCTS DURING
COMBUSTION IN A DIESEL ENGINE USING A FOUR
ZONE MODEL
HS-023 951

Allison, Joseph R.
PERFORMANCE OF HIGHWAY SAFETY DEVICES.
FINAL REPORT
HS-621 810

Barth, Delbert S.
THE EPA PROGRAM TO ASSESS THE PUBLIC
HEALTH SIGNIFICANCE OF DIESEL EMISSIONS
(ENVIRONMENTAL PROTECTION AGENCY)
HS-023 025

Anderson, V. R.
PROGRESS REPORT ON HYDROGEN PRODUCTION
AND UTILIZATION FOR COMMUNITY AND AU-
TOMOTIVE POWER

Seatty, J. R.
EFFECT OF TREATED CELLULOSE FIBERS ON CUT
GROWTH, CUTTING AND CHIPPING CHARAC-
TERISTICS OF RUBBER COMPOUNDS (TIRE TREADS)
115-073 919

Antoniucci, G.
AÉRODYNAMIC AND CLIMATIC WIND TUNNELS IN
THE PIAT RESEARCH CENTER

Bedrosyan, Loris
A CRITICAL REVIEW AND EVALUATION OF
PUBLISHED ELECTRIC-VEHICLE PERFORMANCE
DATA
HS-024 011

Aronson, Robert B.
BONDED BUS SNAPS TOGETHER
 HS-024 000

Rekker, M. G.
A NOTE ON TIRE ROLLING RESISTANCE DUE TO
TEST WHEEL CURVATURE
HS-02) 934

Bali, S.
COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPEN-
DIX A, SITE SELECTION AND DATA COLLECTION.
FINAL REPORT

Bell, C. A.
TIRE VIBRATIONS
HS-021 816

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR

Beasner, Ludwig, Jr.
GENERATING HYPOTHESES TO EXPLAIN ACCIDENTS AND OTHER RARE EVENTS
HS-023 935

	HS-024 020	Ceronetti, G. AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE PIAT RESEARCH CENTER	HS-023 832
Blocker, Stanley M. THE EPA PROGRAM TO ASSESS THE PUBLIC HEALTH SIGNIFICANCE OF DIESEL EMISSIONS (ENVIRONMENTAL PROTECTION AGENCY)	HS-023 924	Chamberlain, T. W. PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT	HS-803 325
Bladen, Stuart AUTOTEST ADVANCES	HS-023 962	PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT	HS-803 326
Blake, W. H. BATTERY POWERED JEEP AND VAN PER- FORMANCE	HS-023 866	PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT	HS-803 327
Botma, H. A SCHEME FOR EVALUATING A LOCAL QUEUE WARNING SYSTEM (ANALYSIS OF TRAFFIC CON- TROL SYSTEM)	HS-023 922	PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT	HS-803 330
Bradow, Ronald L. UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS	HS-023 862	PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), 1V. INTERIM REPORT	HS-803 331
Bryant, W. A. IRON-AIR BATTERIES FOR ELECTRIC VEHICLES	HS-024 016	PERFORMANCE CHARACTERISTICS OF AUTOMO- TIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT	HS-803 332
Bryden, James E. PERFORMANCE OF HIGHWAY SAFETY DEVICES. FINAL REPORT	HS-023 830	Chana, Howard E. AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PER- FORMANCE AND ECONOMY	HS-023 938
Burton, Frank PRODUCT ENERGY IN THE RUBBER INDUSTRY	HS-023 960	Chang, Man-Feng AN ATTEMPT TO CHARACTERIZE TRAFFIC IN METROPOLITAN AREAS	HS-023 921
Buzzelli, E. S. IRON-AIR BATTERIES FOR ELECTRIC VEHICLES	HS-024 016	Charek, L. T. TIRE VIBRATIONS	HS-023 836
Byer, S. M. A STUDY OF FIFTY-SIX IN-USE CATALYST VEHIC- LES: EMISSIONS AND FUEL ECONOMY	HS-023 853	Church, Richard MODELLING AN OVERSATURATED INTERSECTION	HS-023 829
Callahan, Joseph M. REVOLUTION IN CAR WIRING	HS-023 923	Claybrook, Joan STATEMENT BEFORE THE SUBCOMMITTEE ON THE CONSUMER, SENATE COMMITTEE ON COMMERCE, SCIENCE AND TRANSPORTATION, CONCERNING THE REGULATION OF ODOMETER FRAUD UNDER	
Campbell, B. C. PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AU- TOMOTIVE POWER	HS-024 020		
Carlson, Robert D. PERFORMANCE OF HIGHWAY SAFETY DEVICES. FINAL REPORT	HS-023 830		

OR VEHICLE SAFETY ACT, JULY 26, 1978	HS-810 324		HS-023 827
gh, E. INVESTIGATING DIESEL ENGINE COMBUSTION BY TRANS OF A TIMED SAMPLING VALVE	HS-023 950		
pton, M. J. DATA SOURCES TO SUPPORT THE NHTSA NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS- TRATION OBJECTS INVESTIGATION SYSTEM. FINAL REPORT	HS-803 531		
uer, B. J. THE ROLE OF RHODIUM IN RHO/PT RHODIUM/PLATINUM CATALYSTS FOR D/HC/NOX AND SO4 (CARRON MONOX- IDE/HYDROCARBON/NITROGEN OXIDES, AND ELFATH) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE	HS-023 860		
per, John F. MECHANICALLY RECHARGEABLE, METAL-AIR BATTERIES FOR AUTOMOTIVE PROPULSION	HS-024 013		
elli, A. AERODYNAMIC AND CLIMATIC WIND TUNNELS IN THE FIAT RESEARCH CENTER	HS-023 832		
tin, Frank AERODYNAMICS OF THE MODERN CAR	HS-023 938		
tin, Richard T. HEIGHTENED FEAR OF INFLATION UNDERMINES CONSUMER CONFIDENCE [U.S. ATTITUDES TOWARDS AUTOMOBILES AND OTHER PURCHASES]	HS-023 993		
is, Jeffrey S. THE STATUS OF MANDATORY PMVI (PERIODIC MOTOR VEHICLE INSPECTIONS) THINGS AREN'T GETTING BETTER. OUR 18TH ANNUAL REPORT	HS-023 980		
Lellis, John D. HOW TO DRIVE, REVISED ED.	HS-023 913		
Lellis, John THE HANDICAPPED DRIVER'S MOBILITY GUIDE	HS-023 942		
at, J. C. CONVECTIVE AND RADIATIVE HEAT TRANSFER IN HIGH SWIRL DIRECT INJECTION DIESEL ENGINE	HS-023 948		
atling, J. C. THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM	HS-023 838		
Dolby, David A. A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL STAGE OF VEHICLE DESIGN			HS-023 944
Dowgiallo, E. J., Jr. BATTERY POWERED JEEP AND VAN PER- FORMANCE			HS-023 866
Duncan, Thomas W. TANK TRUCKERS FIGHT INDUSTRY COST CRUNCH. LIABILITY SHELTER IN SHREDS			HS-023 972
Dutt, A. K. INJURY SCALING RESEARCH. FINAL REPORT			HS-803 452
Earnest, Ernest R. COMBINED CYCLE GAS TURBINE FOR AN AUTOMO- BILE APPLICATION			HS-024 022
Eccleston, B. H. AMBIENT TEMPERATURE AND TRIP LENGTH-IN- FLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS			HS-023 908
Ecklund, E. Eugene THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION			HS-024 009
Entsminger, Mark A. AN EXAMINATION OF THE EFFECTS OF THE LOWERED MAXIMUM SPEED LIMIT AND FUEL SHORTAGES IN NORTH CAROLINA. FINAL REPORT			HS-803 454
Ervin, Robert D. THE DYNAMIC STABILITY OF FUEL-CARRYING DOUBLE-TANKER TRUCKS IN MICHIGAN			HS-023 825
Evans, Leonard URBAN FUEL ECONOMY. AN ALTERNATE IN- TERPRETATION OF RECENT COMPUTER SIMULA- TION CALCULATIONS			HS-023 828
Fedewa, William L. AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PER- FORMANCE AND ECONOMY			HS-023 958
Fee, J. A. COST-EFFECTIVENESS AND SAFETY OF AL- TERNATE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPEN- DIX A, SITE SELECTION AND DATA COLLECTION. FINAL REPORT			HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT

HS-023 905

Fine, Eric W.

MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED

HS-023 969

Fleischer, G. A.

STATISTICAL ANALYSES OF COMMERCIAL VEHICLE ACCIDENT FACTORS. VOL. 1, TECHNICAL REPORT, PT. 1, FINAL REPORT

HS-803 418

Gallaghy, M.

CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS

HS-023 916

Gay, E. C.

ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/IRON SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES

HS-024 014

Gibbs, R. E.

A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY

HS-023 853

Glennon, J.

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 3: APPENDIX A, SITE SELECTION AND DATA COLLECTION. FINAL REPORT

HS-023 904

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR

RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

HS-023 839

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT

HS-023 840

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT

HS-023 841

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL MODEL DEVELOPMENT

HS-023 842

COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF ROADWAY DELINEATION TREATMENTS. FINAL REPORT

HS-023 905

Goldsmith, W.

RESPONSE OF A REALISTIC HUMAN HEAD-NECK MODEL TO IMPACT

HS-023 823

Hadden, I., D.

PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER

HS-024 020

Haddon, William J., Jr.

QUADRIPLEGIA AND OTHER MOTOR VEHICLE INJURIES: SOME IMPLICATIONS AND CHOICES FOR MOTOR VEHICLE MANUFACTURERS

HS-023 941

Hahn, William F.

PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE

HS-023 965

Hall, J. C.

LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES

HS-024 013

Hall, R. G.

INJURY SCALING RESEARCH. FINAL REPORT

HS-803 452

Holl, Robert G.

DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT

HS-803 460

Homed, P.

EFFECT OF TREATED CELLULOSE FIBERS ON CUT GROWTH, CUTTING AND CHIPPING CHARAC

- Hancock, Walton M.**
THE DEVELOPMENT OF QUALITY INFORMATION SYSTEMS IN AUTOMOTIVE ASSEMBLY
HS-023 955
- Handley, John C.**
STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE
HS-023 949
- Harding, G. G.**
DESIGN OF ELECTRIC COMMERCIAL VEHICLES FOR PRODUCTION
HS-023 867
- Harrison, B.**
THE ROLE OF RHODIUM IN RH/PT [RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO₄ [CARBON MONOXIDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE] EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE
HS-023 860
- Hartley, John**
BRAKING SAFELY? [NEW EC [EUROPEAN ECONOMIC COMMUNITY] BRAKING REGULATIONS, ANTI-SKID SYSTEMS, AND TRENDS IN BRAKING SYSTEMS]
HS-024 029
60 MPG BY 1985 [MILES PER GALLON, UNITED KINGDOM]
HS-023 933
- Hauer, E.**
TRAFFIC CONFLICT SURVEYS: SOME STUDY DESIGN CONSIDERATIONS
HS-023 910
- Healey, A. J.**
AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROAD-WAY INPUTS
HS-023 971
- Heredy, L. A.**
LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-024 013
- Herman, Robert**
AN ATTEMPT TO CHARACTERIZE TRAFFIC IN METROPOLITAN AREAS
HS-023 921
URBAN FUEL ECONOMY: AN ALTERNATE INTERPRETATION OF RECENT COMPUTER SIMULATION CALCULATIONS
HS-023 828
- Hill, John W.**
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL [IN-TANK ETHANOL CONCENTRATION IN GASOLINE/ALCOHOL MIXTURES, BRAZIL]
HS-023 834
- Hill, B. J.**
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES. EMISSIONS AND FUEL ECONOMY
HS-023 853
- Hofhauer, P.**
DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS
HS-023 964
- Honda, Shoji**
CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]
HS-023 864
- Hueho, W.-H.**
THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD
HS-023 869
- Hueniak, P.**
A VISIBILITY ANALYSIS OF OBSTACLE DETECTION EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE HEADLIGHTING
HS-023 942
- Hucalak, Peter**
ASCERTAINING THE EFFECTS OF ATMOSPHERIC FACTORS DURING VISUAL DETECTION EXPERIMENTS IN AUTOMOBILE HEADLIGHTING
HS-023 831
- Huelke, Donald F.**
INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES
HS-023 927
- Hure, R. W.**
AMBIENT TEMPERATURE AND TRIP LENGTH-INFLUENCE ON AUTOMOTIVE FUEL ECONOMY AND EMISSIONS
HS-023 908
- Hussey, T. M.**
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES. EMISSIONS AND FUEL ECONOMY
HS-023 853
- Imaiizumi, Tetsuo**
TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND
HS-023 870
- Jagodecson, T. R.**
STUDY OF AIR MOTION IN A COMPRESSION IGNITION ENGINE CYLINDER
HS-023 947
- Johnson, R. E.**
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES. EMISSIONS AND FUEL ECONOMY
HS-023 853
- Johnson, Wayne J.**
TECHNIQUE FOR CORRELATING RADIATED NOISE WITH INDIVIDUAL SPARK EVENTS IN AN AUTOMOTIVE IGNITION SYSTEM
HS-023 835
- Jones, B.**
AN EQUAL SENSATION STUDY OF SEATED SUBJECTS IN THREE TRANSLATIONAL MODES [HUMAN REACTIONS TO VIBRATION]
HS-023 988

- Kobe, Kazuyuki**
DEFORMATION AND CORD TENSION OF A BIAS
TIRE IN CONTACT WITH THE ROAD
HS-023 837
- Kabo, M.**
RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT
HS-023 823
- Kagn, H.**
STRESS ANALYSIS OF A TIRE UNDER VERTICAL
LOAD BY A FINITE ELEMENT METHOD
HS-023 932
- Kamoda, K.**
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID
BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 865
- Kamimoto, Takeyuki**
PREDICTION OF SPRAY EVAPORATION IN
RECIPROCATING ENGINES
HS-023 954
- Kaplan, Allison**
HOW THE TRUCKING INDUSTRY IS PROMOTING
THE 55 M.P.H. SPEED LIMIT
HS-023 990
- Kaplan, R. J.**
DATA SOURCES TO SUPPORT THE NHTSA
(NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS-
TRATION) DEFECTS INVESTIGATION SYSTEM.
FINAL REPORT
HS-803 531
- Kaplan, Richard**
FATAL INJURIES TO RESTRAINED PASSENGER CAR
OCCUPANTS
HS-023 926
- Kaplan, Richard J.**
FINANCIAL CONSEQUENCES OF INJURIES IN AU-
TOMOTIVE ACCIDENTS
HS-023 925
- Kann, T. D.**
ADVANCES IN THE DEVELOPMENT OF LITHIUM-
ALUMINUM/METAL SULFIDE CELLS FOR ELER-
TRIC-VEHICLE BATTERIES
HS-024 014
- Kawakatsu, Shiro**
CLEAN TRANSPORTATION FOR NEW TOWNS.
DAIHATSU ELECTRIC VEHICLES IN THE SEIBOKU
AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)
HS-023 864
- Kenel, Francis C.**
HOW TO DRIVE. REVISED ED.
HS-023 913
- Kent, J. H.**
A DRIVING CYCLE FOR SYDNEY (DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA)
HS-023 826
- Kim, Gwan**
EFFECT OF SUPPORT ON NOBLE METAL
CATALYSTS FOR THREE-WAY CONVERSIONS
HS-023 861
- Kirkaldy, J. S.**
A PROGRAM FOR PREDICTING AND CONTROLLING
CARBURIZATION RESPONSE
HS-023 956
- Kohrstein, E.**
CHARACTERIZATION OF MULTIFUNCTIONAL
CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFI-
CATION
HS-023 859
- Kobett, D. R.**
GRADE EFFECTS ON TRAFFIC FLOW STABILITY
AND CAPACITY
HS-023 838
- Koehler, D. E.**
PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6
LITERS), 2V. INTERIM REPORT
HS-803 325
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0
LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 326
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5
LITERS), 4V. INTERIM REPORT
HS-803 327
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. FIRST SE-
RIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7
LITERS) WITH DRESSER VARIABLE-AREA VENTURI
SYSTEM. INTERIM REPORT
HS-803 330
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4
LITERS), 1V. INTERIM REPORT
HS-803 331
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3
LITERS), 2V. INTERIM REPORT
HS-803 332
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID
(3.2 LITERS), F.I. (FUEL INJECTION) INTERIM RE-
PORT
HS-803 333
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. SECOND
SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8
LITERS), 2V. INTERIM REPORT
HS-803 334
- PERFORMANCE CHARACTERISTICS OF AUTOMO-
TIVE ENGINES IN THE UNITED STATES. THIRD SE-

RIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT	IDE/HYDROCARBON/NITROGEN OXIDES, AND SULFATE) EMISSION CONTROL. THE INFLUENCE OF OXYGEN ON CATALYST PERFORMANCE
HS-803 335	HS-023 860
rnfield, Susan M.	Lindsley, E. F.
FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS	THE ROTARY IS NOT DEAD (WANKEL ENGINE)
HS-023 925	HS-024 026
ouse, John K.	Lisper, H.-O.
LIGHTER, CHEAPER COMPOUNDS WITH GLASS BUBBLES IN PLASTICS (WEIGHT SAVINGS IN AUTOMOBILE PARTS)	A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING
HS-024 003	HS-023 987
EVOLUTION IN CERAMIC DESIGN [DIESEL AND GAS-TURBINE ENGINES AND OTHER APPLICATIONS]	Littauer, Ernest L.
HS-023 919	MECHANICALLY RECHARGEABLE METAL-AIR BATTERIES FOR AUTOMOTIVE PROPULSION
	HS-024 015
mpis, Marie	Liu, C. T.
THE KINETIC THEORY OF TRAFFIC FLOW IN THE CASE OF A NONNEGLECTIBLE NUMBER OF QUEUEING VEHICLES	IRON-AIR BATTERIES FOR ELECTRIC VEHICLES
HS-023 920	HS-024 016
urell, H.	Louis, Arthur M.
A VALIDATION OF SUBSIDIARY REACTION TIME AGAINST DETECTION OF ROADSIDE OBSTACLES DURING PROLONGED DRIVING	LESSONS FROM THE FIRESTONE FRACAS [FIRESTONE TIRE AND RUBBER COMPANY'S STRATEGY IN THE INVESTIGATION OF ITS 500 SHARES STEEL-BELTED RADIALS]
HS-023 987	HS-023 833
wson, Thomas E.	Lynn, Cheryl
INJURIES TO REAR-SEAT PASSENGERS IN FRONTAL AUTOMOTIVE CRASHES	AN EVALUATION OF THE IMPACT OF THE VIRGINIA DRIVER IMPROVEMENT PROGRAM. WORKING PLAN
HS-023 927	HS-024 030
y, M. G.	Maegawa, O.
ROAD ACCIDENTS. A COMMUNITY PROBLEM	ACTUAL OPERATING EXPERIENCE OF LEAD-ACID BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 983	HS-023 065
schly, Kim	Mahoney, John E.
USRR EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA	AN ANALYTICAL STUDY OF TRANSMISSION MODIFICATIONS AS RELATED TO VEHICLE PERFORMANCE AND ECONOMY
HS-024 010	HS-023 958
wis, Alvin C.	Mandel, Leon
GUIDE TO HIGH SPEED PATROL CAR TIRES	FUTURE FLASH [CHARACTERISTICS OF U.S. AUTOMOBILES IN THE NEXT DECADE]
HS-023 909	HS-023 988
wis, Ernest, Jr.	Markley, J. H.
GUIDE TO HIGH SPEED PATROL CAR TIRES	INJURY SCALING RESEARCH. FINAL REPORT
HS-023 909	HS-803 452
wis, Martin	Marsh, Joseph C., 4th.
SHOPPING FOR TYRES? [TIRES]	FINANCIAL CONSEQUENCES OF INJURIES IN AUTOMOTIVE ACCIDENTS
HS-023 937	HS-023 925
L. K.	Marshall, W. F.
INJURY SCALING RESEARCH. FINAL REPORT	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT
HS-803 452	HS-803 324
Livin K.	PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SE-
DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT	
HS-803 460	
zhtenstein, I.	
THE ROLE OF RHODIUM IN RHP/T RHODIUM/PLATINUM] CATALYSTS FOR CO/HC/NOX AND SO4 [CARBON MONOX-	

- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 326
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT
HS-803 327
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT
HS-803 328
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 19: 1975 FORD WINOSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT
HS-803 329
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VENTURI SYSTEM. INTERIM REPORT
HS-803 330
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 4: 1976 CHEVROLET 85 CID (1.4 LITERS), 1V. INTERIM REPORT
HS-803 331
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT
HS-803 332
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 333
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT
HS-803 334
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
HS-803 335
- Martino, F. J.
ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES
HS-024 014
- Masulli, James M.
EFFECT OF SUPPORT ON NOBLE METAL CATALYSTS FOR THREE-WAY CONVERSIONS
HS-023 861
- Matsuoka, Shin
PREDICTION OF SPRAY EVAPORATION IN RECIROCATING ENGINES
HS-023 954
- McAlevy, Robert F., 3rd.
A CRITICAL REVIEW AND EVALUATION OF PUBLISHED ELECTRIC-VEHICLE PERFORMANCE DATA
HS-024 011
- McCallum, Peter W.
THE STATUS OF ALCOHOL FUELS UTILIZATION TECHNOLOGY FOR HIGHWAY TRANSPORTATION
HS-024 009
- McCoy, L. R.
LITHIUM SILICON - IRON SULFIDE LOAD-LEVELING AND ELECTRIC VEHICLE BATTERIES
HS-024 013
- McRuer, D. T.
DRIVER'S VISIBILITY REQUIREMENTS FOR ROADWAY DELINEATION. VOL. 1: EFFECTS OF CONTRAST AND CONFIGURATION ON DRIVER PERFORMANCE AND BEHAVIOR. FINAL REPORT
HS-023 852
- McKenson, J. R.
TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT (INDIANA HIGHWAYS)
HS-023 974
- Mennie, Don
HELPING SPEEDERS BEAT THE RADAR RAP
HS-023 961
- Merisalo, A.
MEASURING THE LATERAL POSITION OF VEHICLES ON THE ROAD: SYSTEM AND PRELIMINARY RESULTS
HS-023 930
- Milchon, J. A.
MAPPING MENTAL LOAD IN CAR DRIVING
HS-023 986
- Mighdoll, Phillip
PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE
HS-023 965
- Mikkor, M.
PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION
HS-024 012
- Miles, John
IS YOUR CAR KILLING YOU? OR RATHER, ARE ITS SEATS?
HS-024 028
- Milkins, Eric E.
SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED SPARK IGNITION ENGINE
HS-024 019

- ick, R. W.
PULSE CHARACTERISTICS OF SODIUM SULFATE
CELLS FOR ELECTRIC VEHICLE PROPULSION
HS-024 012
- Mooney, J. J.
THREE-WAY CONVERSION CATALYSTS. PART OF
THE EMISSION CONTROL SYSTEM
HS-023 858
- Moore, M. A.
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES:
EMISSIONS AND FUEL ECONOMY
HS-023 853
- Mourant, Ronald R.
DYNAMIC EYE POSITIONS BY VEHICLE TYPE.
FINAL REPORT OF THE SECOND GENERATION
EYELLIPSE PROJECT
HS-023 943
- Moussa-Hamouda, Effat
DYNAMIC EYE POSITIONS BY VEHICLE TYPE.
FINAL REPORT OF THE SECOND GENERATION
EYELLIPSE PROJECT
HS-023 943
- Mulder, G.
MAPPING MENTAL LOAD IN CAR DRIVING
HS-023 986
- Murphy, B. S.
STUDY OF AIR MOTION IN A COMPRESSION IGNITION
ENGINE CYLINDER
HS-023 947
- Muto, Shiro
TRANSIENT AERODYNAMIC FORCES AND MOMENTS
ON MODELS OF VEHICLES PASSING THROUGH
CROSS-WIND
HS-023 870
- Nagano, T.
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID
BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 865
- Nathman, E.
AN ANALYTICAL AND EXPERIMENTAL STUDY OF
AUTOMOBILE DYNAMICS WITH RANDOM ROAD-
WAY INPUTS
HS-023 971
- Nierpel, Chuck
LET THERE BE LIGHT. AT LAST. A HALOGEN
HEADLIGHT THAT'S LEGAL
HS-024 025
- Nienhardt, J.
CALIBRATION FREQUENCY FOR SKID MEASURE-
MENT SYSTEMS
HS-023 916
- Neville, R. J.
TASK FORCE ON UNDERVEHICLE CORROSION OF
COATED STEELS (SAE-IRON AND STEEL TECHNICAL
COMMITTEE, DIVISION J21)
HS-023 857
- O'Brien, John F.
IS THERE A PLACE FOR THE SIMULATOR IN
DRIVER LICENSING? (NEW YORK STUDY)
HS-023 989
- O'Day, J.
DATA SOURCES TO SUPPORT THE NHTSA
[NATIONAL HIGHWAY TRAFFIC SAFETY ADMINIS-
TRATION] DEFECTS INVESTIGATION SYSTEM.
FINAL REPORT
HS-023 531
- O'Day, James
FATAL INJURIES TO RESTRAINED PASSENGER CAR
OCCUPANTS
HS-023 926
- O'Hanlon, J. F.
DRIVER'S VISIBILITY REQUIREMENTS FOR ROAD-
WAY DELINEATION. VOL. 1: EFFECTS OF CON-
TRAST AND CONFIGURATION ON DRIVER PER-
FORMANCE AND BEHAVIOR. FINAL REPORT
HS-023 852
- Oei, H. L.
A SCHEME FOR EVALUATING A LOCAL QUEUE
WARNING SYSTEM [ANALYSIS OF TRAFFIC CON-
TROL SYSTEM]
HS-023 922
- Okamoto, K.
STRESS ANALYSIS OF A TIRE UNDER VERTICAL
LOAD BY A FINITE ELEMENT METHOD
HS-023 932
- Okazaki, I.
ACTUAL OPERATING EXPERIENCE OF LEAD-ACID
BATTERIES FOR ELECTRIC MILK DELIVERY CARS
HS-023 865
- Okolowicz, John
SYNCHRONOUS TIMING LOOP CONTROLS
WINDSHIELD WIPER DELAY
HS-023 973
- Oppenheim, A. K.
PROSPECTS FOR INTERNAL COMBUSTION ENGINES
AMONG ADVANCED ENERGY CONVERSION
SYSTEMS
HS-024 021
- Orlando, Joseph S.
CORROSION RESISTANT STEEL AND NONFERROUS
MATERIALS FOR METRIC FASTENERS
HS-023 967
- Oswald, Lawrence J.
A TECHNIQUE FOR MEASURING INTERIOR WIND
RUSH NOISE AT THE CLAY MODEL STAGE OF
VEHICLE DESIGN
HS-023 944
- Ouligin, G.
RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT
HS-023 823

- Pak, Tong-Kun**
DYNAMIC EYE POSITIONS BY VEHICLE TYPE
FINAL REPORT OF THE SECOND GENERATION
EYELLIPSE PROJECT
HS-023 943
- Palmer, James A.**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT
HS-003 468
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 6: LOS ANGELES COUNTY,
CALIFORNIA CASE STUDY. FINAL REPORT
HS-003 473
- Parker, Andrew J., Jr.**
THE STATUS OF ALCOHOL FUELS UTILIZATION
TECHNOLOGY FOR HIGHWAY TRANSPORTATION
HS-024 009
- Pennock, M.**
OVERCOMING DENIAL: CHANGING THE SELF-CON-
CEPTS OF DRUNKEN DRIVERS
HS-025 970
- Philipson, L. L.**
STATISTICAL ANALYSES OF COMMERCIAL VEHIC-
LE ACCIDENT FACTORS. VOL. 1, TECHNICAL RE-
PORT, PT. 1. FINAL REPORT
HS-803 418
- Pierman, Richard**
LABORATORY EVALUATION OF NEW LOW ALLOY
GEAR STEELS
HS-025 957
- Plonka, Francis E.**
THE DEVELOPMENT OF QUALITY INFORMATION
SYSTEMS IN AUTOMOTIVE ASSEMBLY
HS-023 955
- Potts, G. R.**
TIRE VIBRATIONS
HS-023 836
- Potts, R.**
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3. APPEN-
DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT
HS-023 904
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE
SUMMARY. FINAL REPORT
HS-023 839
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
- B. DEVELOPMENT AND DESCRIPTION OF COMPU-
TERIZED DATA BASE. FINAL REPORT**
HS-023 841
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 3: APPENDIX
C, STATISTICAL MODEL DEVELOPMENT
HS-023 842
COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 6. APPEN-
DICES D AND E, COST OF ROADWAY ACCIDENTS
AND COST AND SERVICE LIFE OF ROADWAY
DELINEATION TREATMENTS. FINAL REPORT
HS-023 905
- Pondrier, J. M.**
OVERCOMING DENIAL: CHANGING THE SELF-CON-
CEPTS OF DRUNKEN DRIVERS
HS-023 970
- Rabe, Paul R.**
AN ON-BOARD SENSOR FOR PERCENT ALCOHOL
[IN-TANK ETHANOL CONCENTRATION IN
GASOLINE/ALCOHOL MIXTURES, BRAZIL]
HS-023 834
- Ran, B. K. N.**
AN EQUAL SENSATION STUDY OF SEATED SUB-
JECTS IN THREE TRANSLATIONAL MODES [HUMAN
REACTIONS TO VIBRATION]
HS-023 985
- Rashti, P.**
STATISTICAL ANALYSES OF COMMERCIAL VEHIC-
LE ACCIDENT FACTORS. VOL. 1, TECHNICAL RE-
PORT, PT. 1. FINAL REPORT
HS-803 418
- Reger, Mats**
A HIGH ENERGY NICKEL-ZINC BATTERY FOR
ELECTRIC VEHICLES
HS-023 863
- Reinfurt, D. W.**
INJURY SCALING RESEARCH. FINAL REPORT
HS-803 452
- ReVelle, Charles**
MODELLING AN OVERSATURATED INTERSECTION
HS-023 829
- Ripberger, Raymond J.**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT
HS-803 468
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 3: IDAHO CASE STUDY. FINAL RE-

March 31, 1979

- Roberts, P. S.**
INVESTIGATING DIESEL ENGINE COMBUSTION BY
MEANS OF A TIMED SAMPLING VALVE HS-023 950
- Rosenbloom, Sandra**
PEAK-PERIOD TRAFFIC CONGESTION: A STATE-OF-
THE-ART ANALYSIS AND EVALUATION OF EFFEC-
TIVE SOLUTIONS HS-023 850
- Rey, T. K.**
TIRE VIBRATIONS HS-023 836
- Ruckman, J. H.**
PROGRESS REPORT ON HYDROGEN PRODUCTION
AND UTILIZATION FOR COMMUNITY AND AU-
TOMOTIVE POWER HS-024 020
- Rule, G.**
A DRIVING CYCLE FOR SYDNEY [DURATION OF
DRIVING SEQUENCES DURING EMISSION TESTING
OF AUTOMOBILES, AUSTRALIA] HS-023 826
- Sackman, J. L.**
RESPONSE OF A REALISTIC HUMAN HEAD-NECK
MODEL TO IMPACT HS-023 823
- Sandberg, Joel J.**
USER EXPERIENCE WITH ON-ROAD ELECTRIC
VEHICLES IN THE U.S.A. AND CANADA HS-024 010
- Scarlett, Michael**
AUTOTEST ADVANCES HS-023 962
- SHOPPING FOR TYRES? [TIRES] HS-023 937
- Schenkel, Franz K.**
THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON
AUTOMOBILES WITH FRONT AND REAR SPOILERS HS-023 868
- Scott, David**
SAFER DRIVING WITH NEW CAR RADAR HS-023 977
- Scribner, Gary J.**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT HS-803 466
- Sechrest, Lee, ed.**
EMERGENCY MEDICAL SERVICES: RESEARCH
METHODOLOGY. PROCEEDINGS OF A CONFERENCE
HELD IN ATLANTA, GEORGIA, SEPTEMBER 8-10,
1976.
- Sells, Andrew F.**
AN EXAMINATION OF THE EFFECTS OF THE
LOWERED MAXIMUM SPEED LIMIT AND FUEL
SHORTAGES IN NORTH CAROLINA. FINAL REPORT.
HS-803 454
- Selzer, Melvin L.**
A PSYCHOSOCIAL COMPARISON OF DRUNKEN
DRIVERS AND ALCOHOLICS HS-021 968
- Semonin, E. V.**
A NOTE ON TIRE ROLLING RESISTANCE DUE TO
TEST WHEEL CURVATURE HS-023 936
- Shelton, Ella Mae**
MOTOR GASOLINES, WINTER 1977-78 HS-023 940
- Shimotake, H.**
ADVANCES IN THE DEVELOPMENT OF LITHIUM-
ALUMINUM/METAL SULFIDE CELLS FOR ELEC-
TRIC-VEHICLE BATTERIES HS-024 014
- Shuldiner, Herbert**
MORR LIGHT, LESS ELECTRICITY WITH HALOGEN
GRADED-BEAMS [HEADLIGHTS] HS-024 027
- Shutt, E.**
THE ROLE OF RHODIUM IN RH/PT
[RHODIUM/PLATINUM] CATALYSTS FOR
CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE HS-023 860
- Silva, Claudio Z.**
AN EXAMINATION OF THE EFFECTS OF THE
LOWERED MAXIMUM SPEED LIMIT AND FUEL
SHORTAGES IN NORTH CAROLINA. FINAL REPORT.
HS 803 454
- Simanaitis, Dennis**
HEADLIGHT IMPROVEMENTS. BRIGHTEN THE COR-
NERS (AND THE STRAIGHTAWAYS) WHERE YOU
ARE HS-023 918
- Skelton, David T.**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 1: TECHNICAL REPORT. FINAL RE-
PORT HS-803 468
- Skelton, David T.**
EVALUATION AND SYSTEM DESCRIPTION OF ASAP
[ALCOHOL SAFETY ACTION PROJECT] JUDICIAL
SYSTEMS. VOL. 2: PUERTO RICO CASE STUDY.
FINAL REPORT.

Smith, C. C. AN ANALYTICAL AND EXPERIMENTAL STUDY OF AUTOMOBILE DYNAMICS WITH RANDOM ROAD- WAY INPUTS	HS-803 331
HS-023 971	PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 1V. INTERIM REPORT
Smith, Ted J. TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE	HS-803 332
HS-024 023	PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 6: 1976 NISSAN DIESEL 198 CID (3.2 LITERS), F.I. (FUEL INJECTION) INTERIM RE- PORT
Snellings, I. R. BATTERY POWERED JEEP AND VAN PER- FORMANCE	HS-803 333
HS-023 866	PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 7: 1977 FORD 171 CID (2.8 LITERS), 2V. INTERIM REPORT
St. John, A. D. GRADE EFFECTS ON TRAFFIC FLOW STABILITY AND CAPACITY	HS-803 334
HS-023 638	PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. THIRD SE- RIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT
Stafford, G. K. TRAFFIC SPEED REPORT NO. 105. INTERIM REPORT [INDIANA HIGHWAYS]	HS-803 335
HS-023 974	Stark, John A. DIESEL TAKEOVER IN CLASS 6 (DIESEL ENGINES IN MEDIUM-DUTY TRUCKS)
HS-023 324	HS-023 996
Stamper, K. R. PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT	Stear, Robert A. MOOD DIFFERENCES OF MEN ARRESTED ONCE AND MEN ARRESTED TWICE FOR DRIVING WHILE INTOXICATED
HS-803 325	HS-023 960
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT	Stewart, J. R. INJURY SCALING RESEARCH. FINAL REPORT
HS-803 326	HS-803 452
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 16: 1975 VOLVO 121 CID (2.0 LITERS), F.I. (FUEL INJECTION) INTERIM REPORT	Strable, Warren C. STOCHASTIC COMBUSTION AND DIESEL ENGINE NOISE
HS-803 327	HS-023 949
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 17: 1975 BUICK 455 CID (7.5 LITERS), 4V. INTERIM REPORT	Stamp, Fred D. UNREGULATED EMISSIONS FROM THREE-WAY CATALYST CARS
HS-803 328	HS-023 862
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT	Stutts, J. C. INJURY SCALING RESEARCH. FINAL REPORT
HS-803 329	HS-803 452
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 19: 1975 FORD WINOSOR 351 CID (5.7 LITERS), 2V. INTERIM REPORT	Stutts, Jane C. DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL. FINAL REPORT
HS-803 330	HS-803 460
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. FIRST SE- RIES, REPORT NO. 20: 1975 CHEVROLET 350 CID (5.7 LITERS) WITH DRESSER VARIABLE-AREA VELOCITY SYSTEM. INTERIM REPORT	Sudar, S. LITHIUM SILICON - IRON SULFIDE LOAD-LEVEL- ING AND ELECTRIC VEHICLE BATTERIES
HS-803 330	HS-024 013
PERFORMANCE CHARACTERISTICS OF AUTO- MOTIVE ENGINES IN THE UNITED STATES. SECOND	Sugitoni, Masahiro CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA (MODEL SUBURBAN COMMUNITY IN JAPAN)
	HS-023 864

- Sullaman, S. J.**
CONVECTIVE AND RADIATIVE HEAT TRANSFER IN
A HIGH SWIRL DIRECT INJECTION DIESEL ENGINE
HS-023 948
- Summala, H.**
MEASURING THE LATERAL POSITION OF VEHICLES
ON THE ROAD: SYSTEM AND PRELIMINARY
RESULTS
HS-023 930
- Taylor, J. I.**
COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 3. APPENDIX A, SITE
SELECTION AND DATA COLLECTION. FINAL REPORT
HS-023 904
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 1: EXECUTIVE
SUMMARY. FINAL REPORT
HS-023 839
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 2: FINAL REPORT
HS-023 840
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 4: APPENDIX B, DEVELOPMENT
AND DESCRIPTION OF COMPUTERIZED DATA BASE. FINAL REPORT
HS-023 841
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 5: APPENDIX C, STATISTICAL
MODEL DEVELOPMENT
HS-023 842
- COST-EFFECTIVENESS AND SAFETY OF ALTERNATE
ROADWAY DELINEATION TREATMENTS FOR RURAL
TWO-LANE HIGHWAYS. VOL. 6: APPENDICES D AND E, COST
OF ROADWAY ACCIDENTS AND COST AND SERVICE LIFE OF
ROADWAY DELINEATION TREATMENTS. FINAL REPORT
HS-023 905
- Tetard, C.**
LE DEUX ROUES REVUE DE LA LITTÉRATURE FRANÇAISE
ET ÉTRANGÈRE (TWO-WHEELED VEHICLES: A REVIEW OF
FRENCH AND FOREIGN LITERATURE)
HS-023 906
- THE SAFETY OF TWO-WHEELED VEHICLES: A STUDY OF AN
ACCIDENT-PRODUCING SITUATION: THE INTERSECTION
(SECURITÉ DES DEUX ROUES. ÉTUDE D'UNE SITUATION
ACCIDENTOGENE: L'INTERSECTION)
HS-023 856
- Thompson, C. E.**
THREE-WAY CONVERSION CATALYSTS. PART OF THE
EMISSION CONTROL SYSTEM
HS-023 858
- Timberio, Thomas J.**
THE STATUS OF ALCOHOL FUELS UTILIZATION
TECHNOLOGY FOR HIGHWAY TRANSPORTATION
HS-024 009
- Tindal, M. J.**
AN INVESTIGATION OF CYLINDER GAS MOTION IN THE
DIRECT INJECTION DIESEL ENGINE
HS-023 946
- Tippelmann, Gutz**
A NEW METHOD OF INVESTIGATION OF SWIRL FORTS
HS-023 945
- Tozawa, Y.**
STRESS ANALYSIS OF A TIRE UNDER VERTICAL LOAD BY A
FINITE ELEMENT METHOD
HS-023 932
- Turner, Richard H.**
POLICE LEARN DRIVING SKILLS AT LOW SPEEDS
HS-023 995
- Unnewehr, L. E.**
PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR
ELECTRIC VEHICLE PROPULSION
HS-024 012
- Vinnikur, Amiram**
A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND
ALCOHOLICS
HS-023 968
- Von Krusenstierma, Otto**
A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC
VEHICLES
HS-023 863
- Vukovich, Dennis**
LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS
HS-023 957
- Waller, Patricia F.**
DRIVER PERFORMANCE TESTS: THEIR ROLE AND POTENTIAL.
FINAL REPORT
HS-803 460
- Watson, Harry C.**
SOME PROBLEMS AND BENEFITS FROM THE HYDROGEN FUELED
SPARK IGNITION ENGINE
HS-024 019
- Way, Richard J. B.**
INVESTIGATION OF INTERACTION BETWEEN SWIRL AND JETS IN
DIRECT INJECTION DIESEL ENGINES USING A WATER MODEL
HS-023 953
- Werner, P. L.**
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES:
EMISSIONS AND FUEL ECONOMY
HS-023 853
- White, Lawrence J.**
THE AUTOMOBILE INDUSTRY
HS-023 928

- COMBUSTION IN A DIESEL ENGINE USING A FOUR ZONE MODEL
HS-023 951
- INVESTIGATING DIESEL ENGINE COMBUSTION BY MEANS OF A TIMED SAMPLING VALVE
HS-023 950
- Whitehurst, E. A.**
CALIBRATION FREQUENCY FOR SKID MEASUREMENT SYSTEMS
HS-023 916
- Wiedemann, B.**
DATA BASE FOR LIGHT-WEIGHT AUTOMOTIVE DIESEL POWER PLANTS
HS-023 964
- Wildervanck, C.**
MAPPING MENTAL LOAD IN CAR DRIVING
HS-023 986
- Williams, T. J.**
AN INVESTIGATION OF CYLINDER GAS MOTION IN THE DIRECT INJECTION DIESEL ENGINE
HS-023 946
- Wilson, Timothy D.**
A PSYCHOSOCIAL COMPARISON OF DRUNKEN DRIVERS AND ALCOHOLICS
IIS-023 968
- Wolber, W. G.**
NEW SENSORS FOR AUTOMOBILE ENGINE CONTROL
HS-023 976
- Woods, W. A.**
EFFECTIVE FLOW AREA OF PISTON CONTROLLED EXHAUST AND INLET PORTS
HS-023 952
- Woolley, R. L.**
PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER
IIS-024 020
- Wozniak, G. P.**
A STUDY OF FIFTY-SIX IN-USE CATALYST VEHICLES: EMISSIONS AND FUEL ECONOMY
HS-023 853
- Wright, C. C.**
CONTROL OF DRIVERS' ROUTE CHOICE: PIPE DREAM OR PANACEA?
IIS-023 851
- Yoshida, Yasushi**
TRANSIENT AERODYNAMIC FORCES AND MOMENTS ON MODELS OF VEHICLES PASSING THROUGH CROSS-WIND
HS-023 870
- Yumoto, Ichiro**
CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENBOKU AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]
HS-023 864

- Safety Dept., Falls Church, Va.**
THE HANDICAPPED DRIVER'S MOBILITY GUIDE
HS-023 912
- HOW TO DRIVE. REVISED ED.**
HS-023 913
- Argonne National Lab., Chemical Engineering Div., 9700 South Cass Ave., Argonne, Ill. 60439**
ADVANCES IN THE DEVELOPMENT OF LITHIUM-ALUMINUM/METAL SULFIDE CELLS FOR ELECTRIC-VEHICLE BATTERIES
HS-024 014
- Army Mobility Equipment Res. and Devel. Command, Electrochemical Div., Ft. Belvoir, Va.**
BATTERY POWERED JEEP AND VAN PERFORMANCE
HS-023 466
- AGA A.B., Innovation Center, Sweden**
A HIGH ENERGY NICKEL-ZINC BATTERY FOR ELECTRIC VEHICLES
HS-023 463
- Billings Energy Corp., Provo, Utah**
PROGRESS REPORT ON HYDROGEN PRODUCTION AND UTILIZATION FOR COMMUNITY AND AUTOMOTIVE POWER
HS-024 020
- Booz, Allen and Hamilton Inc., Design and Devel. Div., Cleveland, Ohio 44131**
PRELIMINARY POWER TRAIN DESIGN FOR A STATE-OF-THE-ART ELECTRIC VEHICLE
HS-023 965
- California Inst. of Tech., Jet Propulsion Lab., Pasadena, Calif. 91103**
USER EXPERIENCE WITH ON-ROAD ELECTRIC VEHICLES IN THE U.S.A. AND CANADA
HS-024 010
- Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225**
RESEARCH SAFETY VEHICLE, PHASE 3. STATUS REPORT NO. 9. 1 MAY TO 30 JUNE 1978
HS-003 533
- Cummins Engine Co., Inc., Columbus, Ind. 47201**
TRUCKER'S GUIDE TO FUEL SAVINGS
HS-023 915
- Daihatsu Motor Co., Ltd., Japan**
CLEAN TRANSPORTATION FOR NEW TOWNS. DAIHATSU ELECTRIC VEHICLES IN THE SENDOKU AREA [MODEL SUBURBAN COMMUNITY IN JAPAN]
HS-023 964
- Degeuss-Wolfgang, Germany**
CHARACTERIZATION OF MULTIFUNCTIONAL CATALYSTS FOR AUTOMOTIVE EXHAUST PURIFICATION
HS-023 859
- Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003**
PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 17: 1975 BUICK 455 CID (7.3 LITERS), 4V. INTERIM REPORT
HS-003 327
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 18: 1976 FORD 400 CID (6.6 LITERS), 2V. INTERIM REPORT**
HS-003 328
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. SECOND SERIES, REPORT NO. 5: 1977 FORD 140 CID (2.3 LITERS), 2V. INTERIM REPORT**
HS-003 312
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 1: 1977 VOLVO 130 CID (2.1 LITERS), F.I. [FUEL INJECTION] INTERIM REPORT**
HS-003 335
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PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 14: 1975 MAZDA ROTARY 70 CID (1.1 LITERS), 4V. INTERIM REPORT
HS-003 324
- PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. FIRST SERIES, REPORT NO. 15: 1975 DODGE COLT 98 CID (1.6 LITERS), 2V. INTERIM REPORT**
HS-003 325
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MOTOR GASOLINES, WINTER 1977-78
 HS-023 940
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 HS-024 009
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GASOLINE: MORE MILES PER GALLON
 HS-023 854
- Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Germany**
THE CALCULATION OF THE FLOW FIELD PAST A VAN WITH THE AID OF A PANEL METHOD
 HS-023 869
- Dominion Foundries and Steel Ltd., Canada**
TASK FORCE ON UNDERVEHICLE CORROSION OF COATED STEELS (SAB-IRON AND STEEL TECHNICAL COMMITTEE, DIVISION 32)
 HS-023 857
- Dutcher Industries, Inc., San Diego, Calif. 92111**
TOWARD A HIGH EFFICIENCY RANKINE CYCLE AUTOMOTIVE ENGINE
 HS-024 023
- Eaton Corp.**
LABORATORY EVALUATION OF NEW LOW ALLOY GEAR STEELS
 HS-023 957
- Engelhard Minerals and Chemicals Corp., Engelhard Industries Div., Menlo Park, N.J. 08817**
THREE-WAY CONVERSION CATALYSTS. PART OF THE EMISSION CONTROL SYSTEM
 HS-023 858
- Environmental Protection Agency**
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 HS-023 862
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PULSE CHARACTERISTICS OF SODIUM SULFUR CELLS FOR ELECTRIC VEHICLE PROPULSION
 HS-024 012
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A TECHNIQUE FOR MEASURING INTERIOR WIND RUSH NOISE AT THE CLAY MODEL. STAGE OF VEHICLE DESIGN
 HS-023 944
- THE ORIGINS OF DRAG AND LIFT REDUCTIONS ON AUTOMOBILES WITH FRONT AND REAR SPOILERS**
 HS-023 868
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March 31, 1979

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EVALUATION AND SYSTEM DESCRIPTION OF ASAP
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HS-803 468

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FINAL REPORT

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PORT

HS-803 470

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NESOTA, CASE STUDY. FINAL REPORT

HS-803 471

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HS-803 472

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QUADRUPLEGIA AND OTHER MOTOR VEHICLE IN-
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MOTOR VEHICLE MANUFACTURERS

HS-803 941

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MENTS ON MODELS OF VEHICLES PASSING
THROUGH CROSS-WIND

HS-803 870

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ACTUAL OPERATING EXPERIENCE OF LEAD-ACID
BATTERIES FOR ELECTRIC MILK DELIVERY CARS

HS-803 855

CO/HC/NOX AND SO₄ [CARBON MONOX-
IDE/HYDROCARBON/NITROGEN OXIDES, AND
SULFATE] EMISSION CONTROL. THE INFLUENCE
OF OXYGEN ON CATALYST PERFORMANCE

HS-803 860

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HS-804 615

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FOR PRODUCTION

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GEAR STEELS

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A PROGRAM FOR PREDICTING AND CONTROLLING
CARBURIZATION RESPONSE

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MOTOR VEHICLES AND MOTOR VEHICLE EQUIP-
MENT, INCLUDING TIRES, JAN. 1, 1978 THROUGH
MARCH 31, 1978, DETAILED REPORTS**

HS-803 529

**EVALUATION OF DIAGNOSTIC ANALYSIS AND
TEST EQUIPMENT FOR SMALL AUTOMOTIVE
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GRESS**

HS-803 536

**OCCUPANT PROTECTION PROGRAM, PROGRESS RE-
PORT, AUGUST 30, 1978 [PASSIVE RESTRAINT
SYSTEMS]**

HS-803 566

MOTORCYCLE SAFETY

HS-803 571

**STATEMENT BEFORE THE SUBCOMMITTEE ON THE
CONSUMER, SENATE COMMITTEE ON COMMERCE,
SCIENCE AND TRANSPORTATION, CONCERNING
THE REGULATION OF ODOMETER FRAUD UNDER
THE MOTOR VEHICLE INFORMATION AND COST
SAVINGS ACT AND THE NATIONAL TRAFFIC AND
MOTOR VEHICLE SAFETY ACT, JULY 26, 1978**

HS-810 324

**National Res. Council Canada, National Aeronautic
Establishment, Ottawa, Ont. K1A 0S2, Canada**

**ASCERTAINING THE EFFECTS OF ATMOSPHERIC
FACTORS DURING VISUAL DETECTION EXPERI-
MENTS IN AUTOMOBILE HEADLIGHTING**

HS-023 831

**A VISIBILITY ANALYSIS OF OBSTACLE DETECTION
EXPERIMENTATION IN UNOPPOSED AUTOMOTIVE
HEADLIGHTING**

HS-023 942

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KENTUCKY, SEPTEMBER 24, 1977**

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CIDENTS AND OTHER RARE EVENTS**

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12232

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FINAL REPORT**

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MENT SYSTEMS**

HS-023 916

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THE INTERSECTION (SECURITE DES DEUX ROUES.
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L'INTERSECTION)**

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SYSTEMS. SUMMARY REPORT**

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SUMMARY. FINAL REPORT**

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**COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 2: FINAL RE-
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HS-023 840

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TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 4: APPENDIX
B. DEVELOPMENT AND DESCRIPTION OF COMPU-
TERIZED DATA BASE. FINAL REPORT**

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**COST-EFFECTIVENESS AND SAFETY OF ALTERNA-
TIVE ROADWAY DELINEATION TREATMENTS FOR
RURAL TWO-LANE HIGHWAYS. VOL. 5: APPENDIX
C. STATISTICAL MODEL DEVELOPMENT**

HS-023 842

**COST-EFFECTIVENESS AND SAFETY OF AL-
TERNATE ROADWAY DELINEATION TREATMENTS
FOR RURAL TWO-LANE HIGHWAYS. VOL. 3: APPEN-
DIX A. SITE SELECTION AND DATA COLLECTION.
FINAL REPORT**

HS-023 904

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HS-024 007
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HS-023 948

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University of California, Berkeley, Calif.

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Systems Technology, Inc., 13766 S. Hawthorne Blvd., Hawthorne, Calif. 90250

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University of North Carolina, Hwy. Safety Res. Center, Chapel Hill, N.C. 27514

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Indiana Univ., Inst. for Res. in Public Safety, 400 E. Seventh St., Bloomington, Ind. 47401

HS-803 468

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HS-803 469

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HS-803 470

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HS-803 471

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University of North Carolina, Hwy. Safety Res. Center, Chapel Hill, N.C. 27514

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Calgon Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225

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HS-023 824

NHTSA-RA-75-16

Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003

HS-803 324

Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003; Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142

HS-803 325

Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003; Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142

HS-803 326

Department of Energy, Bartlesville Energy Res. Center, P.O. Box 1398, Bartlesville, Okla. 74003; Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142

HS-803 327

Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 328

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 329

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 330

NIHSA-RA-76-23

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 331

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 332

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 333

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 334

NIHSA-RA-77-07

Department of Energy, Bartlesville Energy Res. Center,
P.O. Box 1398, Bartlesville, Okla. 74003; Transportation
Systems Center, Kendall Square, Cambridge, Mass. 02142
HS-803 335

NSF-AER75-0377

Georgia Inst. of Tech., School of Aerospace Engineering,
Atlanta, Ga.
HS-023 949

W-7405-ENG-48

University of California, Lawrence Livermore Lab., Liver-
more, Calif.; Lockheed Missiles and Space Co. Inc., Palo
Alto, Calif.
HS-024 015

AAA-3772	HS-023 912	DOT-TSC-NHTSA-78-13	HS-803 329
Ball-952880 *	HS-023 915	DOT-TSC-NHTSA-78-14	HS-803 330
BERC/OP-76/32	HS-803 324	DOT-TSC-NHTSA-78-15	HS-803 331
BERC/OP-77/41	HS-803 326	DOT-TSC-NHTSA-78-16	HS-803 332
BERC/OP-77/42	HS-803 325	DOT-TSC-NHTSA-78-17	HS-803 333
BERC/OP-77/44	HS-803 327	DOT-TSC-NHTSA-78-18	HS-803 334
BERC/OP-77/52	HS-803 328	DOT-TSC-NHTSA-78-19	HS-803 335
BERC/OP-77/53	HS-803 329	DOT-TSC-NHTSA-78-8	HS-803 334
BERC/OP-77/56	HS-803 330	DOT-TSC-NHTSA-78-9	HS-803 325
BERC/OP-77/57	HS-803 332	DSR/ONSER-228	HS-023 836
BERC/OP-77/58	HS-803 331	FHWA-NY-77-57	HS-023 830
BERC/OP-77/60	HS-803 335	FHWA-RD-77-168	HS-023 852
BERC/OP-77/61	HS-803 333	FHWA-RD-78-50	HS-023 839
BERC/OP-77/62	HS-803 334	FHWA-RD-78-51	HS-023 840
BERC/PPS-78/3	HS-023 940	FHWA-RD-78-52	HS-023 904
CRN780731-00323	HS-023 984	FHWA-RD-78-53	HS-023 841
DHEW-PHS-78-3196	HS-023 824	FHWA-RD-78-54	HS-023 842
DOE/CS-0043	HS-023 929	FHWA-RD-78-55	HS-023 905
DOE/EIA-0076	HS-023 984	FHWA-TS-78-224	HS-023 916
DOE/NASA/0595-78/1	HS-023 965	GMR-2750	HS-023 914
DOT-P-6170.1	HS-023 854	IEEE-78-CH1372-2-ENERGY-Vol-1	HS-024 008
DOT-TSC-NHTSA-78-10	HS-803 326	IEEE-78-CH1372-2-ENERGY-Vol-2	HS-024 018
DOT-TSC-NHTSA-78-11	HS-803 327	IEEE-78-CH1372-2-ENERGY-Vol-3	HS-024 024
DOT-TSC-NHTSA-78-12	HS-803 328	JHDP-78-14	HS-023 974

LTR-ST-987		SAE-770368	
NAE-MS-141	HS-023 831		HS-023 861
NASA-CR-135341	HS-023 942	SAE-770369	HS-023 862
NBS-SP-480-33	HS-023 965	SAE-770384	HS-023 863
NCHRP Proj. 7/10	HS-023 909	SAE-770385	HS-023 864
NCHRP-185	HS-023 850	SAE-770386	HS-023 865
NCHSR-75-46	HS-023 818	SAE-770387	HS-023 866
NRC-16780	HS-023 824	SAE-770388	HS-023 867
NTSB-HAR-78-4	HS-023 942	SAE-770389	HS-023 868
ONSER-203	HS-021 966	SAE-770390	HS-023 869
PB-279 096	HS-023 906	SAE-770391	HS-023 870
PB-279 505	HS-023 824	SAE-770392	HS-023 832
PB-279 837	HS-023 830	SAE-770394	HS-023 944
PB-284 436	HS-023 907	SAE-770404	HS-023 945
PB-287 735/AS	HS-803 418	SAE-770405	HS-023 946
PR-Apr-May-78	HS-803 529	SAE-770406	HS-023 947
PR-Aug-78	HS-801 568	SAE-770407	HS-023 948
RR-57	HS-803 566	SAE-770408	HS-023 949
SAE-P-75-Vol-1	HS-023 810	SAE-770409	HS-023 950
SAE-P-75-Vol-2	HS-024 008	SAE-770410	HS-023 951
SAE-P-75-Vol-3	HS-024 018	SAE-770411	HS-023 952
SAE-770364	HS-024 024	SAE-770412	HS-023 953
SAE-770365	HS-023 857	SAE-770413	HS-023 954
SAE-770366	HS-023 858	SAE-770414	HS-023 955
SAE-770367	HS-023 859	SAE-770415	HS-023 956
		SAE-770416	

SAE-770419	HS-023 967	UM-HSR4-78-14	HS-803 571
SAE-770420		VHTRC-79-WP8	
	HS-024 007		HS-024 030
SAE-780613		ZN-6069-V-22	
	HS-023 908		HS-803 533
SAE-780634		78-1	
	HS-023 964		HS-803 618
SAE-780645			
	HS-023 853		
SAE-789052			
	HS-024 009		
SAE-789204			
	HS-024 013		
SAE-789205			
	HS-024 014		
SAE-789212			
	HS-024 019		
SAE-789214			
	HS-024 020		
SAE-789283			
	HS-024 015		
SAE-789284			
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SAE-789363			
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SAE-789391			
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SAE-789393			
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SAE-789525			
	HS-024 022		
SAE-789526			
	HS-024 023		
SAE-789652			
	HS-024 021		
SASI-78-1087			
	HS-023 914		
SP2M-N			
	HS-023 984		
ST1-TR-1065-I			
	HS-023 852		
Transplex/OSU-156			
	HS-023 916		
TRRI-SR-352			
	HS-023 910		

CONTRACTS AWARDED

**ALCOHOL HIGHWAY SAFETY LEGISLATIVE
FORMATION SYSTEM**

The following tasks shall be performed to update the Alcohol Highway Safety Legislative Information System: supply, on a yearly basis, a State of the Law Reference consisting of a full printout of all laws amending statutes relating to the alcohol-drug and highway safety subjects enumerated in the representative source list (RSL) of all fifty (50) states, the Commonwealth of Puerto Rico, and the District of Columbia, such laws are enacted from 1 Jan 78 through 31 Dec 78; update the 1978 "Alcohol and Highway Safety Laws: A National Review," which will include the 1978 collection of State law amendments/enactments relating to alcohol-drug and highway safety; and review all new case law using the RSL subject matter index as the screening criterion in the reporting of cases which significantly interpret or affect major alcohol and highway safety legislation or practice.

Deen Systems Corporation, 20010 Centany Boulevard,
Crownstown, Maryland 20767
Contract No. HS-5-01141-00
Contract Value \$24,980.00
Contract Completion Date 31 Mar 79.

T-HS-7-01640 Mod. 2

VEHICLE RECORDING SYSTEM DESIGN

The ten (10) model recorders fabricated, four (4) instead of two (2) shall be subjected to operational tests, shock and vibration tests, and environmental tests in accordance with the Environmental Test Plan dated 13 Nov 78; the remaining six recorders shall be delivered. During all testing the recorder accuracy shall be monitored.

Dynamic Science, Inc., 1850 W. Pinnacle Peak Road, Phoenix,
Arizona 85027
Contract No. HS-7-01640-00
Contract Value \$24,980.00
Contract Completion Date 31 Mar 79.

T-HS-7-01763 Mod. 6

**EVALUATION/ASSESSMENT SYSTEMS
DEVELOPMENT**

Paragraph one of requirements is deleted and replaced by the following: the purpose of the project is to develop a system for planning, programming, and evaluating a state's 402 program. The products of this effort will be a handbook(s) and a final report on the proposed management system approach. Phase 1, Task 3 is deleted and replaced by the following: incorporate the problem identification process developed under contract No. DOT-HS-7-01400 into a planning activity that will secure the state's entire serious highway safety problems identified in a systematic and cost-effective manner; develop a programming system that will result in the establishment and prioritizing of individual projects to fulfill overall program needs; and develop an evaluation/assessment system that incorporates and/or establishes measurements for the major highway safety impact problem modules, as well as indirect assessment and evaluation criteria, methodology,

and reporting procedures for measuring programs; to establish methodology and rationale for determining programs to be evaluated/assessed, and define the basic data system requirements and processing capabilities necessary for implementation of the evaluation/assessment system. Phase 1, Task 4 is deleted and replaced by the following: concurrent with the development of the management system manuals, the contractor shall identify and screen a list of candidate demonstration states, and select up to ten demonstration states. Phase 2, Task 5 is deleted and replaced by the following: work will begin with the demonstration states to prepare for the conduct of the demonstration of manuals with the management system process. Phase 2, Task 6 is deleted and contractor will conduct state demonstrations of the management system by using the manuals over one full management cycle (planning, programming, implementation, monitoring/assessment, and evaluation) culminating in the state's preparation and submission of annual reports of the state's total highway safety program; and collect information on the manuals from each demonstration site, and review and evaluate state plans against manual procedures. Upon completion of demonstrations, the demonstration results will be evaluated and the handbook(s) revised as necessary.

National Public Services Research Institute, 123 North Pitt
Street, Suite 500, Alexandria, Virginia 22314
Contract No. HS-7-01763-00
Contract Value \$24,980.00
Contract Completion Date 31 Mar 79.

To be completed thirty-five (35) months from date of contract modification (12 Dec 78).

DOT-HS-8-02035

**COMPLIANCE TEST PROGRAM FOR FMVSS NO.
105-75, "HYDRAULIC BRAKE SYSTEMS--
PASSENGER CARS"**

Hydraulic brake systems of passenger cars shall be inspected and tested in accordance with FMVSS No. 105-75 (National Highway Traffic Safety Administration's (NHTSA) Laboratory Test Procedure TP-105-75-03 dated Jul 78, Sections 1 through 10, 11, 14, 15, and 16). Government furnished instruments (GFI) shall include fifth wheel to measure vehicle velocity and stopping distance, load cell to measure pedal force, decelerometer permanent record of measurements, and a Brake Test Instrument (BTI) model 7610 or comparable.

North American Testing Company, 1801 Speedway Boulevard,
Post Office Drawer S, Daytona Beach, Florida 32015
Contract No. HS-8-02035-00
Contract Value \$24,980.00
Contract Completion Date 31 Mar 79.

DOT-HS-8-02036

**COMPLIANCE TEST PROGRAM FOR FMVSS NO.
105-75, "HYDRAULIC BRAKE SYSTEMS--
PASSENGER CARS"**

Hydraulic brake systems of passenger cars shall be inspected and tested in accordance with FMVSS No. 105-75 (National Highway Traffic Safety Administration's (NHTSA) Laboratory Test Procedure TP-105-75-03 dated Jul 78, Sections 1 through 10, 11, 14, 15, and 16). Government furnished instru-

ments (GPI) shall include fifth wheel to measure vehicle velocity and stopping distance, load cell to measure pedal force, decelerometer permanent record of measurements, and a Brake Test Instrument (BTI) model 76110 or comparable.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road, Phoenix, Arizona 85027
Per Delivery Order
To be completed one (1) year from date of contract award (26 Sep 78).

DOT-HS-8-02068

ADP SERVICES FOR TRAFFIC SAFETY PROGRAMS/MANAGEMENT INFORMATION SYSTEMS

Technical assistance and development of the TSP/MIS (Traffic Safety Programs/Management Information Systems) shall be continued. Specific tasks include the following: update Coordinators and Users Manual, Data Dictionary; for the Program Information Data (PID) module, load new data into data bases and make necessary revisions to improve access/processing/storage of data; design and program additional annual reports; update and refine instructional manuals; for the Standards Implementation Status (SIS) module, load data from annual update; design and program annual reports; design and program turnaround documentation; update users and coordination manuals; for the State Statistics Summary Data (SSS) module, load data after assuring compliance with information at headquarters; design and program annual reports; design and program turnaround reports; update users and coordinators manuals; for the Administrative Evaluation Data (AED) module, structure state submissions to identify that information which is usable and to establish the apparent framework which the state should have used in sending initial submissions; correct arithmetic errors other than obvious mis-transcriptions; display and highlight omissions; check submissions against other available headquarters data; develop an Administrative Evaluation Data Reporting Procedures Handbook; convert DWI (driving while intoxicated) data base to System 2000, and analyze the data for quality and quantity; prepare complete annual reports for each module of the TSP/MIS; provide assistance in the development of the new NPRS (National Project Reporting System) module; and analyze this module and all other modules concerning specific data management requirements; and code and convert all data from each module to an automated format, as received.

Genusys Corporation, 11300 Rockville Pike, Rockville, Maryland 20852
\$63,049.00

To be completed twelve (12) months from date of contract award (30 Sep 78).

DOT-HS-9-02075

DEVELOPMENT OF TEST PROCEDURES FOR PART 581, BUMPER STANDARD

42FR24059, 12 May 77 (any revisions in the Federal Register to be taken into consideration); design and construct a Pendulum Test Device (PTD) outlined in paragraph 581.6, pendulum test conditions, which incorporated the required instrumentation to measure the force specified in paragraph 581.5(c)(7); and conduct a demonstration test on a passenger car to validate the adequacy of the test procedure, PTD, and force-measuring instrumentation.

General Environments Corporation, 5515 Cherokee Avenue, Alexandria, Virginia 22312
\$55,770.00

To be completed ninety-five (95) days from date of contract award (25 Oct 78).

DOT-HS-9-02069

AUTOMOTIVE RATINGS FROM ACCIDENT DATA

Procedures to estimate injury susceptibility (crashworthiness) by manufacturer vehicle subgroups from police-reported data shall be developed and implemented. Two major results are expected: a final evaluation of the feasibility of estimating vehicle crashworthiness from police-reported accident data, and an estimate of the crash injury severity differences among major vehicle makes and models in the U.S. automobile fleet based on police-reported data. To accomplish these goals, it is necessary to estimate injury susceptibility per vehicle under standardized crash conditions. This requires a measurement of occupant injury susceptibility and certain nonvehicular control variables that are related to injury severity (crash severity, restraint system usage, crash configuration, occupant age, occupant seating position, market class size group). A positive identification of the vehicle make and model is needed. Data

Kinetic Research, Inc., 4613 Seybold Road, Madison, Wisconsin 53719
\$14,692.00

To be completed 15 Apr 79.

DOT-HS-6-01392 Mod. 4

NATIONAL CRASH SEVERITY STUDY

The data collection period shall be extended twelve (12) months, and in this extension several special protocols will be deleted in order to allow for the data collection effort to more closely follow the current needs of the National Hwy. Traffic Safety Administration. Increased emphasis will be directed towards evaluations of several existing Federal Motor Vehicle Safety Standards (FMVSS), specifically FMVSS No. 301 (fuel leakage/spillage) and FMVSS No. 214 (side intrusion). A probability sample of police-reported towaway accidents where at least one vehicle was towed from the scene according to the police report, shall be investigated through 31 Mar 1979. The sampling criteria will be adjusted to allow for an oversampling of side intrusion/fire collisions and the addition of light trucks, vans, and multipurpose vehicles. The following special protocols will be implemented on 1 Apr 1978: revised FMVSS 301 fuel leakage/spillage/fire protocol, and revised

procedures special report, off-road object special report, and seat performance special report.

Indiana University Foundation, 335 N. Lansing Street,
Indianapolis, Indiana 46202
Increased \$309,568.00
Extended through 16 Jul 79.

DOT-HS-7-01708 Mod. 5

SUPPORT FOR ANALYTICAL TOOLS FOR AUTOMOTIVE FUEL ECONOMY ACTIVITIES

Support shall be provided for tasks 3 to 5 required for Automotive Fuel Economy activities by the Technology Assessment Division, National Hwy. Traffic Safety Administration (NHTSA). Under Task 3, documentation shall be made of those procedures necessary to, through NHTSA remote terminals, access the computers, analytical tools, data bases, and accounting models identified under Task 2. Under Task 4, additional programming support shall be provided for the solution of various analytical/statistical problems, and for minor modifications to existing NHTSA programs and installation on local Department of Transportation time-sharing vendors. Under Task 5, analytical support shall be provided utilizing the analytical tools, data bases, and accounting models, in the following areas: development of statistically consistent estimates of model parameters from historical data, model error and error sensitivity analysis, model validation studies, and evaluation of effects of Government energy policies such as tax increase, increases in weight due to safety standards on fuel efficiency, and life-cycle costs. av

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
Increased \$98,879.00
Extended to 31 Dec 79.

DOT-HS-7-01719 Mod. 3

ACCIDENT AVOIDANCE CAPABILITIES OF MOPEDS

Specification, acquisition, fabrication, installation, and testing shall be accomplished with respect to moped front brake system components which provide improved stopping performance, and rear wheel/tire components which provide improved side force vs. load capabilities, in order to identify and assess potential safety benefits and problems (Task 5, Test Alternate Moped Brake and Tire Components). Skidplate tests and maneuvers from Task 3 will be employed. The test results and related handling and braking assessments and evaluations shall be documented. Ya

Systems Technology, Inc., 13766 South Hawthorne Boulevard,
Hawthorne, California 90250
Increased \$20,225.00
Extended to 30 Apr 79.

DOT-HS-7-01736 Mod. 4

SAFETY BELT USAGE IN THE TRAFFIC POPULATION

Task 3; A (Data Collection; Obtain Data) is modified as follows: collect data on turnpike ticket toll booths on the New Jersey, Pennsylvania, and Florida turnpikes, four (4) hours per month for twelve (12) months on each turnpike, the observations to be equally divided between day and nighttime periods; and observe safety belt usage in rural areas (up to 50 miles from the city) for each of this study's 19 cities for one (1) day per month for twelve (12) months. 6c

Opinion Research Corporation, North Harrison Street,
Princeton, New Jersey 08540
Increased \$73,959.00
No change

DOT-HS-8-019791A

ANALYSIS OF ELECTRONICS FOR PASSIVE RESTRAINT SYSTEMS

In an effort to prevent the possibility of inadvertent deployment or deployment failure of passive restraint systems due to electromagnetic interference, vandalism, and improper vehicle maintenance, the following work shall be accomplished: determine the external and internal electromagnetic environment in which motor vehicles with passive restraint systems must operate; establish accurate, reliable, and repeatable measurement techniques and procedures for the determination of the electromagnetic susceptibility level of passive restraint systems; develop cost-effective design guidelines and test procedures for manufacturers of passive restraint systems and components to assure electromagnetic compatibility; analyze improved crash sensor logic and diagnostic electronics to enhance the reliability of passive restraint systems; and investigate state-of-the-art vandalism countermeasures and safeguards against improper maintenance. fmsi

U.S. Department of Commerce, National Bureau of Standards,
325 Broadway, Boulder, Colorado 80302
\$250,000.01

To be completed fifteen (15) months from date of contract award (27 Sep 1978).

DOT-HS-8-02022 Mod. 2

ESTABLISHMENT OF THE REPEATABILITY OF PERFORMANCE OF THE SA103C 3-YEAR OLD CHILD TEST DUMMIES

Additional performance evaluations shall be made of three-year-old-child test dummies with flesh parts produced with GBSH/PUFF foaming compound.

Calspan Corporation Advanced Technology Center, 4655
Genesee Street (Erie County), Buffalo, New York 14255
Increased \$29,927.00
To be completed four (4) months from date of contract award (23 Feb 79).

DOT-HS-9-02075

ELDERLY DRIVER RETRAINING

A research effort shall be undertaken to confirm the need of and to recommend an elderly driver retraining program. The objective of the training program will be to compensate for or remedy the performance decrements and maintain satisfactory driving performance for individuals 55 or over years of age. To accomplish the general requirements, the following work shall be conducted: review and assess the driving problems of the elderly, review and assess the current and past driver programs for the elderly, assist the National Retired Teachers Association/American Association of Retired Persons in the assessment of their elderly driver retraining program, and provide recommendations for an elderly driver retraining program(s).

National Public Services Research Institute, 123 North Pitt Street, Alexandria, Virginia 22314
\$158,377.00

To be completed twenty-four (24) months from date of contract award (26 Jan 79).

DOT-HS-9-02076

PASSIVE RESTRAINT DEVELOPMENT OF LIGHT TRUCKS AND VANS

A research effort shall be undertaken to demonstrate that current production-type air cushion restraint systems are capable of providing a minimum of 30-mph BEV (barrier equivalent velocity) protection to the driver and front-seat passengers of light trucks, multipurpose vehicles, and vans. In this three-phase effort, the following tasks shall be performed using four (4) types of vehicles weighing from 3900 lb to 4000 lb: work plan and methodology, computer simulation study, conceptual integration of restraints into vehicles, initial sled test development, initial full-scale car crash tests, final sled development, and final full-scale car crash tests. 0g p

Mimicors, Inc., 55 Depot Road, Goleta, California 93017
\$139,987.00

To be completed thirteen (13) months from date of contract award (1 Feb 79).

DOT-HS-9-02087

**NATIONAL DRIVER REGISTER (NDR)
ALTERNATIVE PROGRAM COST EVALUATION**

The costs that would accrue to the states and to the Federal government for operating the National Driver Register (NDR) as specified in the House version of Title II of the Surface Transportation Assistance Act of 1978, HR 11733, shall be estimated, limited to the operational and programmatic impact of the proposed bill. The following tasks shall be accomplished: review pertinent documentation, determine the impact on the NDR of HR 11733, audit the projected costs for operating the existing NDR system and the rapid response system proposed by the NDR, develop a cost analysis for the NDR system as would be required by Sections 220 through 231 of

HR 11733 as amended by the House, and prepare a briefing package. 0na

CRC Systems, Inc., 125 Church Street, N.E., Vienna, Virginia 22180
\$60,325.03
To be completed by 20 Apr 79.

DOT-HS-9-02104

EFFECTIVENESS OF SAFETY BELT USAGE LAWS

Because only very limited data have been obtained from some countries about mandatory safety-belt usage laws, and because more up-to-date information should be available about these laws, further information relating to the effectiveness of these laws in the 19 countries where they have been adopted shall be obtained, and a comprehensive report shall be prepared.

Peat, Marwick, Mitchell and Company, 1990 K Street, N.W., Washington, D.C. 20006
\$74,500.00

To be completed six (6) months from date of contract award (1 Mar 79).

U.S. DEPARTMENT OF TRANSPORTATION
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Washington, D.C. 20590

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